GAS JOURNAL

Vol. 257 **February 23, 1949** **No. 4473**

THE FRENCH *JOURNAL*

WE congratulate our great French contemporary upon nearly three quarters of a century of work in the service of the gas industry. We describe elsewhere in our issue to-day the new cover design which, while being more in keeping, than the old one, with modern taste, will emphasize her position as the technical organ of "Gaz de France."

The gas industry of France has now had experience of something more than two years of existence under national control, and it is as interesting as encouraging to note that her national organizations, both technical and personal, are carrying on with, if anything, increased vigour and vitality. The gas engineer as such has no politics. If his country has decided after democratic discussion and free vote that his industry is to be run as a State service, it remains his duty to serve it and its consumers to the best of his ability and in the interests of the community as a whole. Politically, his is a "silent service."

There are points of difference between gas in Great Britain and gas in France which spring from the difference in native genius between the two peoples. France has always been more inclined to centralization in all forms of national activity than Great Britain. Local government, local autonomy and decentralization, are the marks of British life, and though the tendency for the time being is in the other direction it is a tendency on the whole to be deplored and one which must be watched very carefully if British communal life is not to lose some of its characteristic flavour. We are glad then that the organization of the British gas industry has been centred in the several Area Boards and not concentrated in one Authority. And it is to be hoped that this principle will be carried further in the development of each area and that this decentralization, this preservation of local interest, will be preserved by the setting-up of sub-divisions based upon common industrial and civic character.

It is this very difference which gives value and importance to the free and constant interchange of ideas between ourselves and our continental neighbours. French culture and literature—and we think French science and technology—has long been recognized as the focal point of European culture and science. There is a keen logicality about French thinking which is well calculated to draw together the work of scientists and technologists of widely differing temperament, some leading to elaboration and complication of detail, others to simplification and a frequent recourse to first principles. The French attitude of cool, trenchant criticism, the flexibility combined with precision of the French language, both have something very precious to contribute to the ceaseless discussion and criticism which is the very life blood of progress.

Finally it is interesting to note that nationalization has made no apparent difference to the familiar appearance of the French *Journal* itself. The advertisement pages are still full of competing ideas, the constant renewal of ever new forms of plant and appliances for the manufacture and use of gas in every sphere to which it may be suited. Long may the *Journal des Usines à Gaz* continue to give publicity to everything which touches the production, distribution and utilization of gas and to reflect in its well-written and carefully edited pages the events marking the life of the gas industry both in France itself and throughout the world.

GAS INDUSTRY INFORMATION

IN recent years the Ministry of Fuel and Power has done excellent work in collating on a uniform basis the major figures relating to the working of individual gas undertakings. Shortly after the war the Ministry published general information on the manufacture and supply of gas by authorized undertakings for the years 1938 to 1944 inclusive. Before the war information of the type was published annually by the Board of Trade ; during the war years it was, of course, withheld for security reasons. The first issue after the war (in 1946) also recorded for the first time the quantity of gas supplied by each non-statutory undertaking. That set of statistics was the most comprehensive official document of the kind, and the Ministry had no light task in collecting the figures. Since 1946, this work has continued and has been expanded, and in the "JOURNAL" of Nov. 24 last we gave some of the data contained in the Ministry's Statistical Digest for 1946 and 1947. The Digest contained new tables showing the fuel used according to the nature of the gas-making process, distribution of gas undertakings according to employment, and—a most welcome feature—industrial consumption of gas by large consumers by class of industry and region.

With the coal industry nationalized we now have a weekly statistical statement giving details of mined coal output, manpower, availability of coal to the gas and electricity industries. This statement is useful. The "facts" may be an approximation, but the figures given provide a check against rumour and loose thinking. Since the nationalization of the coal industry information previously published by the Ministry about costs of production have been given quarterly and yearly by the National Coal Board. Since the nationalization of the electricity supply industry information on the quantity of electricity generated by authorized undertakings previously given in the Electricity Commissioners' monthly Press statement has been given in the Ministry's weekly statistical statement. What is going to happen after May 1 next when the gas industry becomes in fact a concern of State? Well over a century and a quarter old, the gas industry throughout that period has been allergic to the collection and dissemination of statistics. From time to time voices have cried out in the wilderness to the effect that it might serve a good purpose if the gas industry knew itself. We ourselves have not been idle in the matter, as, indeed, the "GAS JOURNAL" *Calendar and Directory* testifies ; but official figures were, until the last war, vague and approximate and were no better than those contained in our own voluntary annual digest. The Ministry

of Fuel and Power has built up machinery, commendably light in staff, to acquire working information from individual gas undertakings. We hope that this machinery will not, after May 1, lose its momentum, and that it will continue to exact, on a common basis, the necessary figures for individual undertakings irrespective of modification of nomenclature. The Area Boards have their autonomy, but they would be doing a disservice to the community if they decided to refuse to disclose information about the separate units within their areas. Any such refusal would, of course, be interpreted as a sign of weakness. We hope, too, that when the Gas Consultative Councils are set up they will watch this point and regard it as an immediate duty. We shall, of course, return to this subject when the Councils are established.

We know that the Chairman of the Gas Council has for long had this question of the need for reliable statistics of the gas industry uppermost in mind. In a recent interview Mr. Sylvester expressed himself without any ambiguity about the great weakness of the industry in the past in allowing itself to drift along without full and uniform records of its progress. "One of my dreams," he told us, "is to do something about the setting-up of a statistical branch at Headquarters." We trust that his determination in this regard will have practical effect. We need the statistics as first step, but only as first step. The figures collected will need interpretation in the formulation of policy. They will have to be regarded as evidence of trends of opinion and usage, of habits and requirements of domestic and industrial consumers alike. There is palpable need for a strong information centre in the gas industry or a centre in which all government departments can put their trust and find answer to their questions.

IMPROVED COAL OUTPUT

The overall coal position for the first six weeks of this year shows a marked improvement over the corresponding period of 1948. Cumulative output of deep-mined coal has been 24,018,000 tons, compared with 23,699,600 tons last year, and opencast mining has similarly increased its output from 928,700 tons last year to 1,102,100 tons, representing a total increase for the six weeks period of approximately half a million tons over 1948. Distributed stocks of coal decreased by 347,000 tons during the week ended Feb. 5, and now stand at 12,295,000 tons compared with 14,966,000 tons a year ago. Undistributed stocks also decreased by 50,000 tons, but are 800,000 tons above the level last year. Overall output per manshift for the week ended Feb. 5 was 2.98 tons, compared with 3 tons for the previous week and 2.91 tons for the corresponding week in the previous year. At the coal face it was 2.98 as against 2.91 last year. Although the number of workers on colliery books for the first five weeks of this year showed an increase over 1948, from 291,300 to 296,700, there were fewer workers effectively employed than in 1948 (270,600 compared with 271,100). This decline in effective employment was attributable to *involuntary*, rather than to voluntary absenteeism. Voluntary absenteeism was 5.61%, compared with 6.03% for 1948, for all workers, and 7.12%, compared with 7.71% for 1948, for face-workers; whereas involuntary absenteeism increased from 5.42% in 1948 to 6.85% this year for all colliery workers, and from 6.23% to 7.66% for face-workers.

WAGON STANDAGE

The Railway Executive has given notice to gas undertakings having private railway sidings and operating the Wagon Standage Scheme approved in 1943 terminating the existing agreements and substituting for acceptance a new scheme to operate from the end of this month. The new scheme gives substantial effect to representations made by the British Gas Council and is deemed by the B.G.C. to be satisfactory, subject to individual tests to ascertain the proportion of coal to non-coal traffic at each works being representative and made by mutual agreement and not more frequently than is necessary and to either party being entitled to call for a new test. The principal effect of the new scheme is to increase the standage rate per day per wagon from 1s. 9d. to 2s. 3d., payable in practice by works where the non-coal traffic is under 1.9% of the total coal and non-coal traffic—the position in most gas undertakings. As the proportion of non-coal traffic increases, as ascertained by individual test, the rate will be increased proportionately. The rate will be determined in respect of each works, and not on an undertaking as a whole. The Railway Executive has conceded that wagons over 16 tons capacity (previously 15 tons) and up to and including 22 tons capacity shall be calculated as $1\frac{1}{3}$ wagons. In negotiating the new scheme the B.G.C. has reserved the right to reopen the whole subject if proposals are made by the Railway Executive further to revise the scheme, or the operational formula, which otherwise continues as before, or if the system of individual tests does not work equitably. Revision of the charges for the internal user of wagons is under consideration.

PUBLIC RELATIONS

In an editorial note a few months ago we suggested that the gas industry should encourage the appointment of Public Relations Officers. We considered at the same time the possibility that under State "guidance" a P.R.O. might be appointed to cover a group of undertakings, unifying their propaganda and splitting the cost. On the threshold of nationalization of the gas industry we have been reminded of these words by the publication of a booklet, "Public Relations and Publicity," by Mr. J. H. Brebner, Chief Public Relations and Publicity Officer of the British Transport Commission. There is no need to quote at length from its 42 pages, many of which are concerned only with the technical media and methods at the disposal of the P.R.O., but the author's interpretation of the function of public relations in a nationalized industry is of particular topical significance. From a simple definition of public relations as being concerned with the study of the human factor in industry, he concludes that the more powerful a group is, the more important it is that its public relations and publicity should be well managed and the more difficult it becomes to manage them well. Mr. Brebner says: "The concentration of power and responsibility may be so great that the cultivation of correct attitudes becomes an absolute condition of survival. Such groups are the great nationalized industries like coal mining and transport," and, it may shortly be added, the gas industry. It may be too early to determine what the exact pattern of the gas industry will be after May 1, but few would deny the obvious danger of a loss of local interest and identity consequent upon nationalization. It is therefore interesting to find that Mr. Brebner regards the establishment of effective public relations and publicity as an antidote to the weakening of the human understanding, the interest, and the sympathy that should link the people with the sum total of the organization. In this connexion we are reminded of the words of Mr. Herbert Morrison: "Under the competitive system the threat of withdrawal can be a spur to efficiency. The corresponding safeguard in the case of the socialized industries should be their sensitiveness to public complaint." Mr. Brebner quotes from a recent speech by Sir Cyril Hurcomb, Chairman of the British Transport Commission, in which he said: "In their public relations, the Commission have every desire and intention to be receptive and responsive to complaint and criticism, and not resentful of them. . . . In whatever capacity a man may serve in the great undertaking of the British Transport Commission, he must more than ever be public-minded." Sensitiveness to public needs has long been a feature of the gas industry. Its maintenance and extension under the changed conditions of nationalization may well necessitate the creation of a firm public relations policy. For those interested, Mr. Brebner's booklet is published by the National Council of Social Service, 26, Bedford Square, London, W.C.1. (Price 2s.)

Personal

Alderman W. SHARP, the Sheriff of Nottingham, is to be the next Lord Mayor. He was elected to the City Council in 1934. For over 45 years he has been employed by Metropolitan Gas Meters, Ltd., and was for 30 years a shop steward.

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At a recent meeting of the Directors of the Great Grimsby Gas Company, Mr. W. H. Wintringham, Chairman and Managing Director, made a presentation to Mr. H. E. REDMAN to mark appreciation of his long and able service, Mr. Redman having recently retired from the position of Accountant to the Company. Mr. Redman is succeeded by Mr. W. R. SMOUT, who previously was Accountant to the Walsall Gas Department.

Sir BEN LOCKSPEISER, M.A., M.I.Mech.E., F.R.A.S., Chief Scientist at the Ministry of Supply, has been appointed to succeed Sir Edward Appleton, K.B.E., K.C.B., as Secretary to the Committee of the Privy Council for Scientific and Industrial Research. He will take up his new appointment on May 1.

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Mr. GORDON WESTON, B.Sc. (Eng.), has been appointed Assistant Director of the British Standards Institution. Mr. Weston took his engineering degree at King's College, London, 1921-24. He was at the Fuel Research Station till 1927, when he joined the British Standards Institution. During the 21 years that he has been with the B.S.I., he has worked in nearly every section of the Institution, and, more recently, has been in charge of a large number of the industry committees in the Engineering Division.

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Mr. NORMAN LOE has been appointed representative of E. Boydell & Co., Ltd., Manchester, manufacturers of Muir-Hill dumpers, loaders, and shunting tractors, in the North-West of England and North Wales. He has been closely associated with plant users in this area for the past 12 years and he has spent four years in Spain on electro-hydraulic power station construction, which gives him an intimate knowledge of the needs of public works contractors and allied industries. Mr. WHITFIELD, who was previously representative for the area, has been promoted to the post of Chief Factory Representative and his duties will take him to overseas territories.

Obituary

The Parkinson Stove Co., Ltd., announce with regret the sudden death of their Scottish Manager, Mr. LEWIS FLETCHER, senior. He had been in the gas industry for over 50 years, having served in the Glasgow Gas Department before taking up his appointment with the Parkinson Stove Co., Ltd., 27 years ago. He was well known throughout the gas industry in Scotland, and his passing will be regretted by a large circle of friends. His favourite pastime was golf, and in fact he died on the golf course at the end of a round with his old friend David Fulton.

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The death has occurred of Mr. JAMES MACGREGOR, who for almost half a century was associated with two companies whose chemical engineering activities cover nearly 125 years. He was appointed Glasgow representative of Ernest Scott and Co., Ltd., and George Scott and Son (London), Ltd., in 1900, and on the retirement of Mr. Ernest Scott, in 1915, he, with two of his colleagues, acquired control of both companies. Later control passed entirely into his hands and he formed an association with Henry Balfour and Co., Ltd., of Leven, who since Mr. MacGregor's retirement in 1944, have controlled both companies. Mr. MacGregor was one of the founders of the Institution of Chemical Engineers.

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The death occurred on Feb. 18 of Mr. ROBERT W. C. BEYNON, of Daison Rise, Chatto Road, Torquay, who retired in 1945 after 60 years' association with the gas industry.

Aged 92, he was the oldest member of the Southern Association of Gas Engineers and Managers, of which he was President in 1898 and of which he was elected an Hon. Member in 1946. After serving his articles as a trainee Gas Engineer with the Exeter Gas Light and Coke Company, he became Engineer and Manager of the Torquay Gas Company in 1885 and held the position until the amalgamation of the Torquay and Paignton Companies in 1923, when he took his seat on the Board. In 1926 the Torquay and Paignton Company absorbed the Torquay Corporation Gas Department, and in 1938 it took over the Totnes Gas Company. Mr. Beynon remained a Director until 1945, when his retirement was accepted with regret. During his active days he served with distinction on the District Committees of the Federation of Gas Employers and the National Gas Council. He always took a keen interest in the welfare and conditions of employment for all employees, and his activities in this direction were reflected in the high standard of the conditions found in the undertaking. As a young man Mr. Beynon was a playing member of the Torquay Rugby Football Club, and on retirement to less vigorous sport he showed considerable prowess on the golf course, and was an original member of the South Devon Golf Club.

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The death of Mr. S. J. INGRAM occurred at Paignton on Feb. 19, at the age of 82. He was Managing Director and Engineer of the Truro Gas Company, and several other gas companies in Cornwall, until the formation of the South Western Gas Corporation, Ltd., of which he became Chairman and Technical Director. He retired at the end of 1937 from the position of Chairman and Technical Director, but retained his seat on the Board and continued to give the Corporation the benefit of his ripe experience until the end of 1945, when he retired from the Board after over 60 years' service with the gas industry in which he attained considerable eminence, not only locally, but in the national councils as a representative of the smaller undertakings. He leaves a widow, one daughter and three sons, one of whom, Mr. L. P. Ingram, Engineer and General Manager of the Taunton and District Gas Company, is this year's President of the Southern Association of Gas Engineers and Managers.

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The death occurred on Feb. 19 of Mr. DOUGLAS H. HELPS, of Donegal, Northcourt Avenue, Reading, who retired at the end of 1944 from the position of Engineer and Manager of the Reading Gas Company after 41 years' service. Mr. Helps started as a pupil to his brother, Mr. J. W. Helps (Birmingham Gold Medallist and President both of the old Institute and the present Institution of Gas Engineers), first at Weston-super-Mare and then at Croydon, and in 1884 he was appointed Assistant Engineer to the Croydon Gas Company. During his 15 years with that Company the capacity of the works and the consumption of gas were more than doubled. In 1898 Mr. Helps became Engineer and Manager at Redhill, where a large increase in the output of gas soon necessitated considerable alterations and additions to the plant. From Redhill Mr. Helps went to Reading, and during his 41 years there the output of gas increased by 353%. The incandescent gas mantle had already displaced most flat-flame burners in private houses, and one of Mr. Helps's first steps at Reading was to improve the street lighting of the borough by the general adoption of incandescent lamps. During his time there he modernized and greatly extended the works, which became one of the finest in the country. Mr. Helps was a member of the Executive Committee of the National Gas Council from its formation in 1916 until he retired. He was elected to the Committee of the Gas Companies' Protection Association in 1906, and was a member of the Executive Committee of the British Commercial Gas Association from 1911 until he retired. On the formation of the Conjoint Conference of Public Utility Associations Mr. Helps was appointed as one of the representatives of the Gas Companies' Protection Association. As a young man he was an athlete of outstanding ability, shining especially in cross-country running and Rugby football. He was Captain of the Croydon Club for five years, in the Surrey County side for many years, and in English trials, playing in North v. South matches. He was also an enthusiastic fisherman.

Diary

Feb. 24.—**Scottish Junior Gas Association (Western District):** Visit to G. and J. Weir, Ltd., Cathcart.

Feb. 24.—**Institution of Chemical Engineers** (Joint Meeting with Low Temperature Group of the Physical Society): "Materials of Construction for Use at Low Temperatures," E. W. Colbeck. Geological Society, Burlington House, Piccadilly, W.1. 5.30 p.m.

Mar. 1.—**Wales and Monmouthshire Junior Gas Association:** Visit to Colliery, No. 5 Area, N.C.B., Rhymney Valley.

Mar. 1.—**National Federation of Gas Coke Associations:** National Technical Committee, Gas Industry House, 2.30 p.m.

Mar. 3.—**Midland Junior Gas Association:** Evening visit to the works of Brotherton & Co., Ltd., Birmingham.

Mar. 4.—**Scottish Junior Gas Association:** Joint Meeting of Eastern and Western Districts in Glasgow. Address by F. M. Birks (Junior Vice-President, Institution of Gas Engineers).

Mar. 8.—**National Federation of Gas Coke Associations:** General Committee, Gas Industry House, 10 a.m.

Mar. 9.—**B.G.C. Domestic Development Committee,** Gas Industry House, 2.30 p.m.

Mar. 9.—**B.G.C. Technical Sub-Committee:** Gas Industry House, 10.30 a.m.

Mar. 9.—**Eastern Junior Gas Association:** Visit to Bury St. Edmunds Gas Company. "Some Thoughts on Education in the Gas Industry," E. H. Winch. "Public Relations in the Gas Industry," R. W. Hilham.

Mar. 11.—**London and Southern Junior Gas Association:** "Dust Problems in Gas-Works Practice," A. J. S. Wiseman. Gas Industry House, 7 p.m.

Mar. 12.—**Manchester District Junior Association of Gas Engineers:** Jubilee Dinner. Engineers Club, Albert Square, Manchester.

Mar. 15.—**Midland Junior Gas Association:** "Carburetted Water Gas," S. C. Crathorn.

Mar. 16.—**Yorkshire Junior Gas Association:** President's Day at Huddersfield. Visit to Leeds Road Gas-Works, and visit to Hopkinsons, Ltd.

Letter to the Editor

Appointments to Area Board Staffs

DEAR SIR,—The Area Boards, having now been constituted, are presumably engaged in setting up their establishments in order to be in a position to take over control as smoothly as possible on vesting date. Some of the Boards have already announced appointments to senior positions on their staff but few vacancies have been advertised in the Technical Press.

The British Gas Staff Association, which has in membership a considerable number of senior officers of the industry, is aware of concern that the opportunity to apply for the senior positions in the nationalized industry may not be given and that the Boards will appoint initially only those who are known personally to them, possibly limiting such appointments to officers at present serving in the Area concerned.

The Association brought this matter to the notice of Mr. Sylvester in December, before many appointments had been published and was informed that it was the intention of all the Chairmen of the Area Boards that as wide a field as possible would be covered in their search for suitable people and that advertisements would be freely used. Mr. Sylvester also said recently: "We want to be quite sure that we have gone through all the skilled men we have got before going outside the industry to make these appointments." His policy in this matter is appreciated, and that he intends to carry it out is evidenced by the advertising of the position of Chief Accountant to the Gas Council. Area Boards, however, are, in general, filling the senior posts without advertisement.

If the nationalized industry is to be successful, there must, from the outset, be a new spirit of frankness and co-operation between employed and employers. There must be no hint of undue preference to the previous associates of those appointed by the Minister to govern the industry and, to obtain the best possible staff to serve them at the highest level, the Area Boards should give full opportunity for any qualified officer of the industry to apply for any senior position which is available in any part of the country. Any delay and inconvenience caused by this method will be amply rewarded by loyal and enthusiastic service from all levels of staff when it is realized that there will be opportunities in the nationalized industry and that the sole criterion is ability.

Yours faithfully,

F. C. HENFREY-SMITH.

General Secretary, British Gas Staff Association.
203, Knightsbridge, London, S.W.7.
Feb. 15, 1949.

GAS RESEARCH BOARD HEADQUARTERS

The Gas Research Board has now established its headquarters at The Abbey, Southend Road, Beckenham, Kent (Telephone: Beckenham 5014/6). Although the new offices and laboratories are not yet actually ready for occupation, Dr. J. G. King, Director, has moved in this week, and the Utilization Section (formerly c/o Main Water Heaters, Ltd., 200, Thornton Road, Croydon), and the Intelligence Section (formerly at 144, Cromwell Road, S.W.7) will be following quite shortly.

The registered office of the Board remains at Gas Industry House, 1, Grosvenor Place, S.W.1.

AREA BOARDS: APPOINTMENTS AND ADDRESSES

A NUMBER of staff appointments and changes of addresses of the temporary or permanent headquarters of the Area Gas Boards have been notified since we published last week the latest available information.

Northern.

Mr. EDWARD CROWTHER, President of the Institution of Gas Engineers, has resigned from the Board of the Newcastle-upon-Tyne and Gateshead Gas Company and his appointment as General Manager and Chief Engineer of the Company, on his taking up the duties of Chairman of the Northern Gas Board.

Mr. JOHN F. JACKSON, who has, for a number of years, been Secretary and Solicitor to the Newcastle-upon-Tyne and Gateshead Gas Company and Secretary to the Stanley and District Gas Company has been appointed Secretary of the Northern Gas Board. Prior to joining the Newcastle Company, Mr. Jackson, on completing his education at Birmingham University and qualifying with Honours, was from 1933 Solicitor to the Mid-Southern Utility Company with its headquarters at Aldershot, which undertaking operated and controlled Associated Utilities, Ltd., and a number of gas, water, and electricity undertakings in Southern England. He is a Director of the Alnwick Gas Company, a member of the Law Society, and Chairman of the Northern Regional Joint Council for Gas Staffs.

Mr. WILLIAM R. GARRETT, who has since 1946 been Chief Constructional Engineer with the Newcastle-upon-Tyne and Gateshead Gas Company, has been appointed Constructional Engineer to the Northern Gas Board. Mr. Garrett served his apprenticeship with Samuel Cutler and Sons, Ltd., and in 1927 became technical assistant in the Chief Engineer's Department of the South Metropolitan Gas Company until his transfer to Newcastle. He holds the Higher National Certificate of the Institution of Mechanical Engineers and is an Associate Member of the Institutions of Civil, Structural, and Gas Engineers.

East Midlands.

Mr. A. GWYNNE DAVIES, M.B.E., M.A., LL.B., Town Clerk of Loughborough, has been appointed Secretary to the East Midlands Gas Board.

Mr. G. A. HOWARD, A.C.A., of Price, Waterhouse & Co., has been appointed Chief Accountant.

Mr. E. H. HARMAN, B.Sc., General Manager and Secretary of the Commercial Gas Company, has been appointed Commercial Manager. After many years' service as Secretary of the Commercial Gas Company, Mr. Harman undertook the additional duties of General Manager in 1944.

The East Midlands Gas Board has opened temporary offices at the offices of the Leicester Corporation Gas Department, Millstone Lane, Leicester.

Wales.

Mr. C. B. MAWER, for several years Secretary, and formerly Assistant Secretary, of the Severn Valley Gas Corporation and Gas Consolidation, Ltd., has been appointed Secretary of the Wales Gas Board.

North Thames.

The address of the North Thames Gas Board for all communications until vesting date, May 1, will, by courtesy of the Gas Light and Coke Company, be 30, Kensington Church Street, London, W.8 (telephone: Western 8141). On vesting date the Board's chief office will be set up at that address.

South Eastern.

The South Eastern Gas Board has now opened offices at 4-6, Wandsworth Road, London, S.W.8, to which all communications should be addressed. The telephone number is Reliance 1691 and 1692.

Southern.

The Southern Gas Board announces that Mr. T. E. D. MASON, B.Com., F.C.I.S., F.L.A.A., Secretary and Accountant of the Southampton Gaslight and Coke Company, has been appointed Secretary of the Board. For management purposes the Area has been divided into four divisions, and the Chairman, Deputy Chairman, and Divisional Managers will constitute the Management Committee. The Divisional Managers have been appointed as follows:—

Mr. J. T. HAYNES, M.I.C.E., Engineer and General Manager, Bournemouth Gas & Water Company (Western Division).

Mr. F. G. SYMON, A.M.I.Mech.E., M.Inst.Gas E., Engineer and General Manager, Reading Gas Company (Central Division).

Mr. W. K. TATE, M.A., A.M.I.C.E., M.Inst.Gas E., Director and General Manager, Portsmouth and Gosport Gas Company (Eastern Division).

Mr. A. TRAN, A.M.I.Mech.E., M.Inst.Gas E., General Manager and Chief Engineer, Oxford and District Gas Company (Northern Division).

A NEW COURSE FOR SCHOOL CHILDREN

A new development, part of the educational work of the Women's Gas Council, is the training of schoolgirls in the use of gas for domestic purposes. Following the recent publication of their Syllabus of Gas Training for Students of Housecraft, several requests were received by the Council for a less advanced Course, suitable for schools. The Syllabus is arranged to cover a series of 10 lessons which, besides giving instruction in the use of all domestic appliances, teach how gas is made; the use of coal in the home, in its raw state, and converted into gas and electricity; the system of distribution of gas; and how pressure is controlled. This new Course has been enthusiastically welcomed by schools in Coventry and recently 86 girls sat for the examination. Sixty-seven of these passed and 10 of them gained honours.

Mrs. W. M. Buchanan, Secretary of the Women's Gas Council, attended the distribution of the Certificates presented to the girls by the Mayor of Coventry, Councillor W. H. Malcolm.

Enquiries are being received both from Domestic Science Colleges and from Education Authorities in other areas.

GAS IN FRANCE

(From Our Special Correspondent)

THE *Journal des Usines à Gaz* marks the beginning of its 73rd year with a new cover design, the realization of a wish it was prevented from gratifying before by the poverty of the war years and those which followed. The new cover has white titles on a green ground and will present a photograph each month of some notable work in progress of erection or after completion. This month it is a general view of the coke oven plant in course of construction at Cornilon, St. Denis. Above this view is a symbolic map of France, with the caption "Gaz de France" across it, while below is the title *Journal des Usines à Gaz, Revue de l'Industrie du Gaz.* There was talk of changing the name but "After three quarters of a century of existence the *Journal des Usines à Gaz* has acquired 'patents of nobility'; it is one of the doyens of the technical Press and we could not contemplate without sadness the disappearance of a name which has become identified with the paper and which, during so many years, has been favourably known in every part of the gas industry in France and in the world at large." Founded on May 5, 1877, by MM. S. Jordan, D. Monnier and E. Servier, the *Journal* will remain what it has always been, a Review of the Gas Industry, and what it has been since 1946, the technical organ of "Gaz de France," in which nothing will come amiss which touches the production, distribution, and utilization of gas and whose pages will reflect the daily events of the life of our industry within the framework of the law of nationalization.

Wishing his readers health and happiness in the new year the Editor expresses the hope that Gaz de France, whose Council of Administration has just been completed, may achieve in 1949, equilibrium, if not the prosperity which is the due of a devoted personnel who, although fewer in numbers than before nationalization, have achieved the production and distribution of a volume of gas exceeding by nearly 50% that of 1938.

Propagation and Stability of Flames

The principal article in this issue is one setting out the present state of knowledge of the mechanism of the propagation and stability of aerated flames, by M. P. Delbourg whose own work in this field is well-known in this country. This problem, he remarks, has for long attracted the attention of many research workers because it is the basis of every question on the use of gaseous fuels. Until recently work was mainly confined to the propagation of flames in static gaseous mixtures; the work was mainly experimental because the complete theory of so complex a phenomenon could only be established with success if it was based on a large number of experimental results. More recently a certain number of workers have attacked the problem of the stability of flames in gaseous mixtures in movement corresponding directly to the study of gas burners. Different explanations of experimental observations have been proposed independently by workers isolated from one another by the circumstances of war, but it now seems possible to collect existing knowledge on the question by reference to publications which have appeared abroad during the last 10 years.

M. Delbourg has found his task facilitated on the one hand by papers presented in London at the Autumn Research Meetings of the Institution of Gas Engineers particularly those of L. T. Minchin (Comm. No. 328) and G. W. Culshaw and J. E. Garside (Comm. No. 325) and on the other hand by the discussions between the numerous French and other workers at the International Conference on the Kinetics and Mechanism of the Reactions of Ignition and Combustion in the gaseous phase held in Paris, April 26-May 1, 1948.

His essay is limited to the method of propagation of combustion by deflagration, *i.e.*, characterized by low velocities, leaving aside the phenomena of detonation or explosion. Within this limitation will be included the majority of the problems arising in the combustion of gas in the presence of air and at atmospheric pressure. The several theories are set out in chronological order. In conclusion it is noted with pleasure that thanks to recent work, both in France and elsewhere, we possess fairly precise ideas on this question but which do not yet amount to a qualitative theory of the phenomenon.

From the experimental point of view it is now possible to calculate with precision the principal characteristics of aerated flames as regards, (a) the basic velocity of deflagration which determines the surface of the front of the flame and the height of the blue cone, (b) the critical velocity of flow which conditions the phenomenon of lighting back or firing at the injector, and (c) the critical velocity which provokes the "blow-off" of the flame.

If the present development of the theory does not yet permit the calculation *a priori* of the three quantities mentioned above direct from the nature of the gas and the conditions of utilization, it does give very valuable indications in certain cases and notably in the domain of the comparative study of different combustible gases. It is probable that the complete theory, which we hope will soon be established, will be very complex and will permit the determination of these three quantities only after long calculations, and perhaps not very precise at that. What is desirable to find is a single quantity characteristic of each combustible gas from the point of view of the structure and stability of the aerated flame. From this factor, which would be determined by a very rapid experimental method, it ought to be possible to calculate these three fundamental quantities. There exist already empirical methods giving the characteristics of combustible gases by means of indices of reference but these methods only permit the classification of gases without the possibility of calculating the basic factors necessary to the complete study of all problems arising in the utilization of these gases.

Success in this direction is eminently desirable, because in view of the increasing diversity of gases used as combustibles it is necessary that each of them shall be characterized by some factor other than the calorific value and giving advance information on its capabilities of utilization in apparatus of well defined types.

Painting—The Colour Scheme

Continuing his series on the æsthetics of the gas-works, M. Veillon deals with the choice of colours in the painting of the several pieces of apparatus and particularly of the gasholder. In general, writers have been preoccupied with the influence of colour in the environment upon the efficiency of production. The colouring of workshops exerts psychological and physiological influence upon the work people. Different codes of colour have been tried, combinations of colour to render the shops more agreeable and more productive. In the painting of machines two parts are distinguished, the working parts which should be painted in lively colours and the stationary parts in darker shades. Grey is recognized as depressing, while the lighter greens, the dominant colour of nature, is pleasanter. Tar is sinister! In a particular machine shop the machine beds were painted green, the upper portions buff and the moving parts bright red. Apart from these local colours, there are colours to indicate the different functions of, for instance, pipe lines and cables; these should always be bright.

In the treatment of gas-works plant reference is made to the Standard of Colours known as Afnor. The following recommendations are made. For machines, a clear grey-green with webs or distinct parts picked out in a darker shade, the selection to be made on the spot; cast-iron or concrete bases a darker shade still. For mains and pipe lines a distinction is made between outside work and that situated in buildings where it may become dirty—these should be grey throughout (aluminium) with the function marked in rings of the standard colour at significant points, the neighbourhood of valves or apparatus—and interior work in clean buildings where standard colours may be used throughout, gas connections being grey obtained with aluminium or other paint. Valves may be painted yellow at the inlet, blue at the outlet and red on the body; all small cocks may be bright red. Manometers may have large tubes grey with the small tubes yellow for the inlet and blue for the outlet of the apparatus.

Interiors of buildings containing machines, workshops, washplaces for the greater part of France are pale green on the walls with darker shades towards the floor and for the timber work. In the south, warmer shades are used such as ochre with brown towards the base. Buff may also be used. The pale yellow shades are very luminous, but too easily soiled for our industry. Ladders, platforms, handrailing may be in aluminium, while fire preventive appliances will be bright red.

Painting the Gasholder

After a brief note on the painting of the outside of the works, M. Veillon turns to the gasholder.

What can be done to reduce the prominence of the gasholder in urban surroundings? Is it possible to achieve appreciable results by a choice of colours or perhaps by a design of colouring and to what extent? One may adopt some of the ideas from the camouflage of wartime. The apparent form of an object may be destroyed by coloration or it may be merged into the environment, or the two may be combined. The colours, bright combined with neuter, are combined in schemes on a scale suitable to the desired effect, never in motley. Some examples are given of walls and buildings treated in this way.

The problem is difficult in the case of telescopic holders, par-

ticularly those using the oil film ; for dry holders it is evidently simpler. The instance of two small gasholders is cited ; situated in valleys surrounded with bushes, meadows and gardens, they are painted all over in light green with satisfactory results. Other holders are painted grey all over, or with a white pattern on a dark ground, or grey with the upper portions white or aluminium, or with the upper part white with a suggestion of chequer work. Too many gasholders are still painted entirely in black !

The gasholder at Chartres is 30 m. high by 24 m. diameter (say, 100 ft. by 80 ft.). Its aspect from several viewpoints is studied. The tank is not conspicuous from any of them. The theory of the treatment is to divide it into two parts. The upper portion would be painted in a very clear grey, *i.e.*, the two upper stages of the framing together with the two top rings of the bell and the crown. The remainder of the holder would remain painted with tar. In two other instances, at St. Malo and Quimper, only the upper portions of the holders are visible and these against the sky. It is therefore proposed to paint in clear grey or white, the framing, stairways and platforms, the crown and the two top rings.

For dry gasholders some form of design has been suggested. The subject is a delicate one and the results sometimes open to question. A bad design may emphasize rather than reduce the prominence of the holder. In general the upper portion would be painted white and the lower grey or green. The form to be given to the dividing line is the problem. A straight line gives too geometrical an effect and should be reserved for quite small holders. A waved line conforms better to "nature" ; a crenelated line is indicated where the background is one of "houses." Horizontal bands alternating in grey and green, or grey and stone colours, have been suggested, but here again the effect is too geometrical for large holders. An interesting result may be obtained with chequers, elongated horizontally, in alternating shades. Other patterns have been suggested.

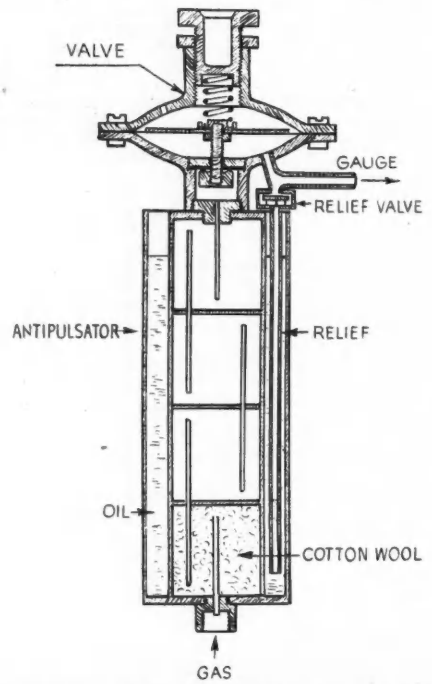
The possibilities of similar treatment for water-sealed holders are much reduced. There is the particular case of the holders visible from above where the crown is particularly conspicuous. In this case a design might be employed in two shades recalling the colour scheme of an assemblage of roofs.

Two final observations are (a) that the use of the holder for publicity notices accentuates its prominence and (b) that it is possible to envisage in important and difficult cases the suspension from the frame-guiding of light and very simple definite camouflage, particularly for holders situated within the city.

M. Veillon's article is illustrated by his usual interesting and informative sketches.

Safety Devices for Gas Compressors

M. A. Gouffe, Chief of the Physics Department of Research, Gaz de France, describes improvements in certain safety devices



for gas compressor stations in which there is the risk at certain times in the day of vacuum conditions in the distribution system which might result in accidents at the points of consumption. To obviate this risk it is the practice to place at the inlet of each compressor a metallic manometer which at a certain minimum pressure makes or breaks an electric contact which by a system of relays automatically stops the machine. In practice the operation of this arrangement has certain defects. In the first place the gauge must be sensitive in the neighbourhood of zero pressure since this is the moment when automatic stopping is required. But if for compressors fed at low pressure one can use manometers ranging from 0 to 200 mm. water which still give good readings at zero, it is not the same for stations fed from high pressure mains which may exceed 500 mm. and where manometers ranging from 0 to 800 mm. may be used which have very poor sensitivity in the region of zero. On the other hand reciprocating compressors give rise to pulsations, with amplitudes of some tens of millimeters of water which renders automatic regulation difficult if not impossible.

The solution of this problem was confided to the Physics Department some three years ago and an antipulsater and safety valve have been designed and put into service. These two elements are described separately together with a combination of the two in a single piece of apparatus, placed between the main and the manometer, the principles of which can be seen from the sketch here reproduced.

The New "Gas Council"

New Councils of Administration for Gaz de France and Electricité de France have now been appointed. Each contains representatives of the Government, consumers and personnel. In the "Gas Council," the Government is represented by two members representing the Ministry of Finance, two the Ministry of Industry and Commerce (including the Director of Fuels), one the Ministry of Agriculture (the Inspector General of Rural Engineering) and one the Ministry of Public Works (the Inspector General of Ponts et Chaussées (Bridges and Roads). There are six consumers' representatives, including three mayors. While the several grades of personnel are represented by three members for technical and administrative staffs, one for general employees and two for "workmen."

It is noted that the first "law" of 1949 concerns Gaz de France It fixes the participation of the State in the working deficit of 1948 by the opening of a credit of six milliards of francs and it enjoins the Government to ensure the effective financial autonomy of the Service and to permit tariffs to be regulated so that the deficit shall be gradually reduced so that it may become self-supporting. Particularly, the accounts of Gas and Electricity are to be kept distinct and separate.

News Items

The 66th Congress of the Gas Industry will be held at Lyons in the week June 20-25.

M. Gaston David, Engineer to the Direction of Equipment of Gaz de France, gave a lecture on Dec. 14 on the question of supply of propane by insulated pipe-line. Within the next 10 years about 200 undertakings should see their gas supply converted to propane (40 installations should be changed over before the end of 1950) and a number of new installations brought into use. The consumption of propane will then reach 12,000 tonnes for distribution and a total of 15-20,000 tonnes if account is taken of the use of propane in large works. The sources of propane will be about 5,000 tonnes from the refining of indigenous petroleum and 50,000 tons from home refineries of imported oil. Propane will be distributed in three forms, as a mixture with gases rich in hydrogen, as pure propane, and in mixtures with air.

The position of coal stocks, threatened by the strikes of October, has been re-established during November and December. After an interruption of mining for a month it is not surprising that stocks are low. Those of the Gas Industry are hardly equal to 20 days' consumption, but in spite of this the situation is not for the moment considered grave. Coal output has risen rapidly, imports during December rose to 300,000 tons per week and a million tonnes supplementary has been purchased under the Marshall Plan for delivery in December, January and February, while a second million is being negotiated in the U.S.A. Delivery will be curtailed by shortage in shipping, but happily supplies from the Ruhr are increasing, but this is nearly all in the form of metallurgical coke and coke breeze, suitable, that is to say, only to the steel industry.

The British Standards Institution has recently published Addendum No. 1 to B.S. 1449, Steel plate, sheet and strip (P.D. 861). This addendum covers the requirements for stainless steel sheet and strip in the following qualities : En. 56 series : Chromium rust resisting steel sheet and strip. En. 57 : High tensile chromium-nickel rust resisting steel sheet and strip. En. 58 series : Austenitic chromium-nickel rust, acid and heat resisting steel sheet and strip. For each steel the chemical composition and mechanical properties are quoted, and reference is required to the general clauses incorporated in B.S. 1449. Copies can be obtained from the British Standards Institution, Sales Department, 24, Victoria Street, S.W.1, price 1s., post free.

COMMERCIAL AND INDUSTRIAL UTILIZATION OF GAS: NO. 8

By F. DICKINSON, M.Inst.F.,
Industrial Gas Engineer, Newcastle and Gateshead Gas Company

(*Continued from page 368*)

FOOD PREPARATION

Bread, Cakes and Confectionery

(a) *The Process of Bread Making.*

The adage that "bread is the staff of life" is one of those few simple and profound statements common to all creeds, nations, and stages of civilization throughout the ages. The art of bread making and baking has developed in technique and magnitude to a point where it is a highly organized scientific cycle of manufacturing processes, from the entry of ingredients into a bakery to the minutiæ of detailed and widespread distribution. In its simple forms bread making has been practised from the earliest recorded times when grain was ground by hand with pestle and mortar to produce flour which was mixed to a paste with water, leavened and shaped into small cakes. Flour used for modern bread has the following general constituents :—

	%
Gluten	11.0
Starch	70.5
Sugar	2.5
Soluble proteins	1.0
Fat	1.0
Mineral salts	0.5
Moisture...	Remainder

This flour is obtained from the milling of wheat which has developed from hand grinding to power grinding through the stages of cattle-driven mills, water mills, geared water mills, and windmills, all in connexion with stone milling practice, until steam engine units were developed when roller milling became predominant.

The stone mill consists of two circular stones, the bottom stone being stationary and the top revolving, giving a shearing action to the centrally fed wheat by virtue of a number of radial corrugations, the ground meal being carried towards the periphery by the revolving action of the top stone, and ejected through an aperture around the periphery of the bedstone. Adjustment to suit the nature of meal desired is made by raising or lowering the top stone which is balanced on an iron spindle. In this process the wheat is ground to a meal in one operation, contains all the constituents of wheat mixed together, and is heated somewhat due to the grinding action. The flavour of stone milled flour is considered to be due to the presence of the ground germ in the meal, and the heating-up may assist in distributing the volatile flavouring constituents throughout the meal, as flour is readily susceptible to volatile flavours and foreign odours. On the other hand, the incorporation of the ground germ lessens the keeping quality of such flour owing to the enzymes present becoming active, and causing a musty flavour. It should, however, be kept for a time before usage to improve baking quality, although improvement in stability means some loss of the original flavour.

Roller milling is a gradual process of breaking down the wheat grain. The wheat is thoroughly cleaned, and then conditioned by moisture and heat treatment to provide a uniform moisture content to ensure efficient grinding. It then goes to the first break roll where it is split open, after sifting out any flour the residue goes to the second break roll where it is ground to remove all possible endosperm, is again sifted and goes to the third break roll for grinding, and the residue goes to the fourth break roll. The products, termed "semolinas," from these different pairs of rolls are graded according to particle size, bran particles are removed by air currents in purifiers, and the purified particles go to the final "reduction rolls" where flour is made. The different final rolls are adjusted to the correct pressures for the sizes of semolina and the resultant flour is sifted through woven silk screens in machines termed "centrifugals." The resultant flour is mixed to produce the different market grades, the average extraction of flour from wheat being about 70% of its total weight. The better grades of flour are called "patents." A "first patent" is about 30%-40% of the total weight of wheat, and a "second patent" about 50%-60%. Under wartime conditions millers were requested to de-grade flour to 80%-85% of the total weight in view of the difficulty in maintaining regular supplies of wheat from exporting countries, and the strength or baking qualities of the final blends of English and foreign flours was appropriately affected.

Whilst stone milled flour will only keep for a comparatively short time, roller milled flour will keep for a long time in a cool dry atmosphere, but not indefinitely owing to development of natural acidity in time, which is accelerated by improper storage.

A normal dough for white bread is made up of the following approximate constituents :—

	lb.
Flour (one sack)	280
Water (14 gall.)...	140
Yeast	2.5 to 3.0
Salt	4.5
Malt	2.5
Approximate total	430

The water for mixing is supplied from a tank at about 85° F.; the ingredients are mixed in a dough machine and transferred to a trough for fermentation for an average time of about four hours at about 80° F. It is then weighed off in quantities of 2 lb. 4 oz. to produce final 2 lb. loaves after baking, the loss of 10% in weight being due to the evaporation of the water. In automatic "proving" machines the measured dough is placed in separate pockets, and after passing through the machine is placed in the bread tins, and passed back into the machine for setting before being moved into the swing-tray or continuous flat hearth travelling baking oven.

Except in the Manchester area an average sack of flour produces 188-192 (2 lb.) loaves, and if the latter figure is taken the total weight of mixture will be 192 by 2 lb. 4 oz., or 432 lb. It is then of some interest to calculate the minimum amount of heat required for the various heating reactions, as follows :—

(1) The *average* temperature of a loaf of bread when it leaves the oven is about 212° F. If the dough temperature was 82° F. when the loaf was set there is thus a rise in temperature of 130° F. We thus get 130° F. × 432 lb. × 0.7 specific heat of dough, or 39,312 B.Th.U. required for this heating.

(2) Assuming that 43 lb. of water is turned into steam this represents (212-82) plus 970 × 43 B.Th.U. = 1,100 × 43 = 47,300 B.Th.U.

(3) Assuming that the tins weigh 1¼ lb. each, and the specific heat of tin is 0.11 this equals 130° F. × 192 tins × 1.25 lb. × 0.11 or 3,422 B.Th.U.

(4) Total heat requirements are thus :—

B.Th.U.
39,312
47,300
3,422
110,034

At a combustion efficiency of 85% this represents 275 cu.ft. of gas per sack of flour baked against actual experience with modern travelling type ovens of about 350-400 cu.ft. per sack. The difference is due to the heat losses involved in the furnace structure, &c., which are additional to the above calculated direct heat requirements for the baking process only.

(b) *The Evolution of Large Scale Baking Ovens.*

In the elementary stages it is quite probable that the prepared dough cakes or lumps were either enclosed in a covering of clay and placed in the embers of a dying wood fire to bake, or baked in small preheated stone chambers. This is still done in primitive communities, and in principle was followed in this country for many centuries by the housewife, who baked bread for family requirements in a coal-fired domestic oven; whilst in larger establishments a separate brick oven was used for baking purposes only.

With the development of highways and transport there was a parallel movement of population with consequent enlargement of villages and towns and a desire for improved amenities, one of which was easement of the comparatively heavy cooking duty of bread baking. This was met by the family baker who originally concentrated upon the baking of bread only, and then added the supplementary attractions of cakes and confectionery. For many years the balance remained steady between home baking and the family baker, and still does in rural districts, but in towns the home baking has declined whilst the street corner baker has now to meet the competition of mass-produced baking from large focal plant distributed to a multiplicity of retail shops. Even the latter has a form of competition between large hand-worked ovens and mechanized plant, but nevertheless the family baker in the aggregate is still the backbone of the baking trade and is by no means to be despised.

The evolution of large-scale bread baking is of some interest. The early bread ovens were termed "faggot" ovens, and consisted of a single brick chamber with an arched roof and one door for charging and discharging. A fire of wood faggots was built on the oven hearth, and maintained until the brickwork was red hot. The remains of the fire were then withdrawn, the hearth being cleaned of all charred particles by "scuffling"; the scuffle

being a long wooden rod with a ring on the end to which pieces of hessian or cloth were attached. The scuffle was dipped into water and the hearth cleaned with a rapid circular mopping action to avoid loss of oven heat before charging. The bread was charged by means of a long wooden pole with a flat spade-shaped end, called a "peel," and left to bake on a dying heat. Many people aver that bread baked in ovens of this type has a distinctive pleasant flavour which cannot be obtained by any other method.

The next advance was to have a firebox on the left-hand side of the oven with flues on the right-hand side, scuffling still being necessary to prevent cinders or ash from clinging to the base of the loaves. Another form of solid fuel oven was the hot-air oven. This consisted of baking chambers surrounded by flueways through which passed the products of combustion from a central longitudinal firebox in the base of the setting, and was usually of double-deck construction. Whilst there was no contact of either fuel or flue gases with the articles being baked, there was a tendency towards sooting of the flue passages, whilst careful damper control was essential for even heating. Fuel consumptions were relatively high.

A further development was to separate the source of heat from the bread, and heat the interior of the oven indirectly by means of small-bore sealed wrought iron tubes each containing a fixed quantity of distilled water which turned to steam when the tube ends were heated, hence the term "steam tube" ovens. Some of these were simple horizontal tubes or loops, and others were independent circulating systems, but they had the common object of heating the interior of the ovens without contact of fuel or flue gases with the exposed goods, and the fireboxes were arranged at the side or rear of the ovens, the rows of sealed tube-ends being exposed to both the radiation from the coal or coke bed as well as the rising hot flue gases. Various types and sizes of these ovens are still in common use with single, double, or multiple decks, a standard double-deck size being 8 ft. deep by 6 ft. wide with a loading capacity of half a sack of flour per deck. All these fixed type ovens have to be loaded and discharged with a "peel" although the prepared dough is in tins.

With the increasing output demand a logical development was the design of ovens with retractable hearths for ease of charge and discharge, and the Perkins 11 ft. by 8 ft. single deck oven was one of the earliest in the field, to be developed later into the 10 ft. by 6 ft. double-deck drawplate oven, which is probably the most popular oven in general use. In this type there are three horizontal layers of steam-tubes, one above the top deck, one below this and above the second deck, and one below the bottom deck. These give even heating for baking purposes with just that additional top heat to give the required finish to the top of the loaves.

For many years these ovens remained unaltered until mechanization of the entire processing of bread led to the evolution of straight-line production. The broad principles remained, but variations in sources and types of wheat had to be faced and met with flexibility of operations, whilst fractional savings in operating costs were imperative due to fierce competition. This resulted in the design of automatic mixing and proving plant, followed by either a continuous hearth or swing tray baking oven from which the finished product could be conveyed to an automatic wrapping and sealing conveyor machine. There are, of course, a number of such designs made by well-known firms having many years of practical experience in the manufacture of large ovens, but a typical installation is the Baker-Perkins six-sack per hour cyclotherm travelling bread oven. This is of the flat conveyor type, 6 ft. wide by 60 ft. 6 in. long, and is operated by a motor driven variable speed gear which is very accurate in its timing of cycles in the range of 30 to 50 minutes duration. The burner equipment is of the Baker-Perkins—Keith Blackman design, and is mounted on the top of the oven in three independent units, each having a maximum consumption rate of 1,000 cu.ft. of gas per hour and firing into separate combustion chambers from which the heat is withdrawn and circulated through the heating zones by hot gas fans, each zone being separately thermostatically controlled against the required oven temperature, there being no contact of combustion gases with the product passing through the oven.

Through all the development stages of oven design, with the numerous modifications to meet either special finishes, greater demands, or variations in flours, there remain the fundamental principles of bread baking from which there can be little deviation, i.e., that it must be satisfactorily proved and set before baking, and that the baking must be done in a dying temperature; both of which are reasonably critical time-temperature functions. The proving, as indicated, takes about 40 minutes at 80° F., and the baking takes approximately 45 minutes at a commencing temperature of about 500° F. The first stage is that of drying out excess moisture, and the water vapour in the still atmosphere of the oven prevents the outer surface of the loaf from sealing, with resultant stoppage of capillary action, as well as from burning. If, however, additional or excess heat is put into the oven when this moisture has been extracted it has to be done with great care, otherwise the whole batch of bread would be charred within a few minutes.

The baking time varies with the size of loaf, a 2 lb. loaf requiring about five minutes more than a 1 lb. loaf, because of the amount of additional moisture involved, and the finish desired. A longer baking time at a lower temperature produces a somewhat drier loaf with a thicker light brown crust, which is appreciated by some people as being more like the old-fashioned "home-made" loaf. A shorter time at a higher temperature produces a softer loaf with less loss of weight in the process, and a thin tougher crust, which is apt to be dark brown, particularly on the top. In some districts this is considered desirable, and is specifically requested by consumers. In either case the cooking is completed when the centre of the loaf reaches 212° F.

(c) *Applications of Town Gas in a Bakery.*

These can be simply set out, as follows :—

Hot water—at about 85° F. from a tempering tank for dough mixing (estimated at 0.2 therms per sack).
—At 140° F. for normal washing purposes.
—At boiling temperature for canteen requirements.

Steam—required for the provers, also for Vienna or similar ovens, and for space heating in certain instances.

Baking—this is the main load whatever the type of oven, whether initially built for gas-firing or converted from other fuels.

Space heating—gas fires, overhead heaters, or central heating.

Canteen—usual gas-fired equipment.

Normal commercial appliances meet a number of the above loads and need no comment. Gas-fired steam boilers are also standard, but should preferably be arranged for automatic control of both feed water and steam pressure. The conversion of ovens originally designed for solid fuel can present a number of difficulties inherent with variations of design and application, demanding careful consideration with full knowledge and experience of the problems which are the natural perquisite of the oven builders, and it is most desirable that this work should be left in their very capable hands. At the same time it should be borne in mind that a reasonable degree of collaboration with oven builders is essential, particularly in the early stages of gas-fired oven developments, so that the best combination of joint knowledge can be obtained in the final design.

(d) *Fuel Costs.*

Whatever the dimensions of the installation and production, the fuel cost involved must be of considerable importance, but should be fairly related to other relevant costs such as those of labour and transport. This, of course, is primarily derived from the actual consumption of fuel, and average figures for this are are as follows :—

	Therms per sack
Conversion (side flue oven) ...	3.5-5.0
Conversion (peel oven) ...	2.5-3.0
Travelling oven	1.8-2.2

The range of consumptions varies with oven designs and types of heat application required to meet these, but if the calculated figure of 110,000 B.Th.U. per sack of bread be used and average consumption figures of 4.0, 2.75 and 2.0 therms per sack, the respective net efficiency figures will be 27.5%, 40%, and 55%. These may be a little on the optimistic side, but are given to represent the best practice obtainable under good working conditions.

The price of fuels varies throughout the country, and is, therefore, difficult to assess in general terms. To arrive at relative fuel costs it is necessary to combine the gross costs of any fuel with the efficiency of application, and the figures below are given as an indication only, as follows :—

Coke at 80s. ton and 12,000 B.Th.U./lb.	=	3.57d. per gross therm
Coal at 60s. ton and 13,500 B.Th.U./lb.	=	2.38d. per gross therm
Light fuel oil at £10 ton and 19,200 B.Th.U./lb.	=	5.58d. per gross therm
Electricity at ¾d. unit and 3,412 B.Th.U./lb.	=	21.9d. per gross therm
Gas at 6d. therm	=	6.0d. per gross therm

Allowing respective overall combustion efficiencies of 40%, 40%, 70%, 95% and 70%, the relative net costs per therm would be approximately 9d., 6d., 8d., 23d., and 8.6d. For solid fuels there must be allowed labour and ashing costs, with fuel oil there is amortization of storage plant and space, and for electricity there are other overhead costs per unit which should be included.

(e) *Cakes and Confectionery.*

These are linked together as in many general bakeries they are ancillary to the main trade of bread baking. There are naturally some firms which specialize in these to the exclusion of bread, but many districts demand a mixed trade so that the solid cakes of the fruit and slab types are baked in bread ovens at much about the same temperature, but taking approximately 2¼ times that of bread with relatively higher gas consumptions, whereas confectionery or "fancies" require a temperature of about 350° F., and normally follow bread and/or cake baking, using the residual heat in the oven with little or no additional fuel consumption. If the bread load is fairly heavy then portable ovens or multi-deck ovens are installed to permit parallel production of both loads in time for conjoint retail sales.

The fuel costs of mixed baking are difficult to apportion and are usually given as a percentage of the overall revenue from the total production.

(f) *Other Types of Processed Food.*

In some localities there is a demand for additional specialized baked foods such as pies, doughnuts, muffins, crumpets, &c. The former are done as above, but the latter require special baking tables which can be either steam heated or under-gas-fired to give the required temperature to the upper smooth cast iron surface upon which the prepared batter is poured into circular tin shapes of suitable size, and turned over when baked on the under side for the top to be baked.

Canteen, Hotel and Institution Kitchens

Reference has already been made to this trade under the heading of commercial applications, but only in a general way so that greater detail of this type of food preparation does not come amiss at this stage. There is a great similarily in the layout of all the three kitchens mentioned above, the variations mainly depending upon the types of food and meals to be catered for, the incidence of the meals, the quantitative demands, and the heating agents available.

(a) *Kitchen Design.*

Dealing first with the broad aspect of kitchen design, it is essential to have ample floor space, adequate lighting, and good ventilation. Kitchens are usually sited in cramped space in existing buildings, sometimes level with the dining rooms, but mainly either in the basement or on the top floor. The last place is preferable as it allows good natural lighting to be arranged, makes ventilation less of a problem, and prevents kitchen odours and noises from reaching the diners. In hotels the sunny aspects are retained for the dining rooms so that the kitchens usually face north or east. Typical floor area allowances are as follows :—

	Sq. ft. per person
50-100 people	6
100-150 people	5
150-200 people	4
200-300 people	3
300-500 people	2

A great deal depends upon local conditions, and whether the kitchen is to serve a canteen, hotel or hospital, but ample working and walking space should be allowed wherever possible, and the disposition of the preparation, cooking, serving, and washing-up sections should be in proper relation to their functions with a view to one-way flow of operations from the entry of raw materials to the serving of the finished meals. As the psychological aspect is of considerable importance every attempt should be made to ensure bright and clean kitchens by the use of white tiling up to 6 ft.-7 ft. in height with light steam-proof paint above, floors of 6 in. by 6 in. by $\frac{3}{4}$ in. thick red quarry tiles, and light coloured vitreous-enamelled or stainless steel equipment, all of which looks clean at any time and is easily cleaned. Wood floors are not successful as they absorb fat, &c., whilst granolithic, terrazzo and composition floors tend to crack. All floors should be laid with a fall to a gully for washing down. Natural lighting is to be preferred, but where artificial lighting has to be used it must be carefully planned so that the staff do not have to work in their own shadow for any of the individual operations.

In small kitchens the ventilation may be by windows, top lights, or natural draught from hoods, but in larger installations it is by mechanical extraction to ensure frequent and positive air changes, which can be of the order of as many as 20 changes per hour, where complete evacuation of fumes is considered essential.

(b) *Kitchen Equipment.*

The available heating agent has a great bearing on this, as well as the disposition of the kitchen. In canteens the greater amount is gas-fired plant because most canteens are comparatively modern and have been specially designed for the job. Hotels are in a different category as they have mainly been operative for many years and commenced with coal ranges, but owing to the heat thrown off by them and the greater flexibility of gas units they have turned to these. Institutions normally have ample steam facilities and until the boilers are overloaded they do not use many gas appliances except for ward and other ancillary services. Country kitchens naturally use solid fuel or special anthracite ranges, with electric ancillary appliances, where practicable.

The choice of range is often left with the chef, and depends upon his experience and cooking demands. In the London area the chefs appear to prefer the solid top type, but in the provinces there is more demand for the open type hotplate with, possibly, one or two solid-top points. These are preferred in schools and institutions where meals have to be prepared for a definite set time. Small canteens use the unit wall-type oven with open hotplates and build up their oven capacity as demands require. Large canteens are designed for a known maximum capacity and lend themselves to island site layout where one large canopy covers a number of units calling for extraction of steam and fumes—*i.e.*, the group of ovens, meat roasting oven, vegetable and soup boilers, stockpot and fish frying range. A useful figure for oven capacity is 8 lb. of meat per cu.ft. of working space, using door dimensions, not oven interior dimensions.

The standard small or medium sized cooker is quite satisfactory for pastry work unless this is in heavy demand when separate pastry ovens should be used. These are specially designed for rapidity of heating and uniformity of browning, and may consist of one or more shallow compartments.

Steamers are used for the cooking of potatoes, pudding or fish. Where steam is available the pressure type is employed and operates at a pressure of 5 lb./sq.in. In other cases the blow-through type is used. This has a constant-level tinned copper water container at the base of the steamer from which steam is evaporated by a gas rail below. An atmosphere vent is fitted to prevent steam accumulation with thermostatic control set to about 204° F. With this type the operation is very simple and maintenance is negligible. The estimated capacity rating per cu.ft. of space is 24 lb. of potatoes cooked in 45 minutes or 4½ lb. of fish cooked in 20 minutes, so that a steamer having internal dimensions of 1 ft. 6 in. by 2 ft. by 2 ft. can deal with 144 lb. of potatoes, 27 lb. of fish, or about 220 cup puddings (3 in.). The "Rotapan" steamer is a useful appliance where space is limited, with a claim to be able to cook sufficient vegetables and one sweet for 80 people on low gas consumption.

As the steaming of green vegetables is not satisfactory they, and potatoes, can be done in cast iron vegetable boilers which range in capacity from 10-50 gallons. These boilers are direct gas-fired, the vegetables being placed in tiers of wire baskets and immersed in water, and are fitted with a strainer and ample sized draw-off cock. A useful estimate for capacity is 20 gall. per 100 persons, with 4 lb. potatoes of 1½-2 lb. greens per gall.

Where there is a large demand for soup a separate stock-pot stand is an asset, relieving hotplate congestion. For thick soups, milk, or porridge, it is necessary to use cast iron jacketted pans.

Separate units are necessary for the frying of fish and potatoes, and can be obtained as complete entities of one or more pans as required. These have powerful burners to ensure rapid frying. A pan 28 in. by 31 in. will hold ¾ stone of fish and fry this in eight minutes, including loading and unloading. A two-pan range of this capacity will deal with 3 cwt. of potatoes and 4½ stones of fish, or 11½ stones of fish only, when in continuous use for two hours. With limited available fat the practice is to use smaller pans where possible.

Hotclosets and carving tables are important appliances. For serving only, the flat topped hotcloset is sufficient, but combined hotclosets, carving tables and bain maries are essential for certain demands, and various combinations are available. An indication of hotcloset capacities is given below, as follows :—

2 ft. 6 in. long × 2 ft. wide ...	160 × 10 in. plates
3 ft. 0 in. long × 2 ft. wide ...	200 × 10 in. plates
3 ft. 6 in. long × 2 ft. wide ...	240 × 10 in. plates
4 ft. 0 in. long × 2 ft. wide ...	280 × 10 in. plates
4 ft. 6 in. long × 2 ft. wide ...	320 × 10 in. plates
5 ft. 0 in. long × 2 ft. wide ...	360 × 10 in. plates
5 ft. 6 in. long × 2 ft. wide ...	400 × 10 in. plates
6 ft. 0 in. long × 2 ft. wide ...	440 × 10 in. plates

Where the food has to be carved and then kept warm it is usual to place rings over the plates and thus be able to build up a series of piled plates for rapid service.

Considerable quantities of hot water are essential for kitchen requirements, and can be met by a suitable sized gas-fired hot water boiler in conjunction with a lagged storage cylinder of from 150-300 gallon capacity, appropriate to the demand. Water at 140° F. is sufficient for ordinary purposes, but 180°-190° F. is essential for satisfactory washing, rinsing and sterilizing of plates, &c. Where the washing-up load is heavy this can be met with special washing machines of the propeller, brush, or high-pressure jet types. An average allowance for school and canteen hot water requirements is 1 gallon and 1½ gallons per person, respectively. Boiling water for tea and coffee making is readily supplied by one of the many excellent appliances on the market.

(c) *Preparation of Food—Requirements.*

The quantities and types of food, the times of serving and the equipment to meet these conditions are bound together, as shown by the following generalizations :—

Courses.

Adults :
Restaurants or hotels, 7 courses.
Hospitals, 3 courses.
Institutions, 2 courses.

Juveniles :
Orphanages or schools, 3 courses.

Classification of possible food demands.

7 *Course*—soup, fish, entree, joint, poultry, vegetables, sweets, pastry, tea, coffee, milk and grills.
3 *Course*—soup, entree, joint or poultry with vegetables, and sweet.
2 *Course*—entree, joint or poultry with vegetables, and sweet.

Hotel equipment to meet the above.

Kitchen—soup boiler, fish fryer, steamer, roaster, baking oven, vegetable boiler, pastry oven, and boiling table.
Still room—water boiler, coffee and milk urns, griller, toaster, and egg poacher.
Servery—hotcloset, carving table and bain marie.

Approximate (uncooked) food quantities per person.

Restaurant (3 course lunch), ½ pint soup, ½ lb. meat, 8-9 oz. potatoes.
Hospitals (3 course lunch) ½ pint soup, ¾ lb. meat, 8 oz. potatoes (spread over day).
7 *Course Meal*—½ pint soup, 4 oz. fish, 4 oz. meat, 5 oz. potatoes, 3 oz. green vegetables, 3 oz. sweets, &c.

(d) *Average Gas Consumptions.*

These vary considerably with differing meals, menus, and the number of people served as indicated by the following information :—

Gas Consumption (varying with differing meals and menus).

Class of establishment	No. of persons catered for daily	Meals cooked	Average cons. of gas per person per day Cu.ft.
Hospital	450	Breakfast Dinner Teas, &c.	11.3
Canteen	350	Hot luncheons 3 Course	3.5
Restaurant	180	Hot luncheons 5 Course 2 soup, 2 fish 2 joint, 2 entrees 3 vegs., 3 sweets	9.5
Hotel	120	Breakfast Lunch Tea Dinner	18.0
Cafe	775	Hot lunch 2/5ths Teas 3/5ths	7.0
Service mess	120	Breakfast 4 Course Lunch Teas 6 Course Dinner	24.0
Institution	160	Breakfast Dinner Tea Supper	22.0 Probably includes all water heating and boiling by gas

N.B.—The canteen figure is low due to supplying one meal only with no necessity for keeping food hot, and would be doubled if boiling and hot water heated by gas.

In canteen practice a fair figure for cooking a main meal only is 4 cu.ft. of gas/head ; for 100-150 persons an overall daily figure is 12-15 cu.ft. per head, and for 250-300 persons 10 cu.ft. per head covering cooking, tea making, dish washing, &.c., but not space heating.

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AREA ACCOUNTING UNDER NATIONALIZATION

NEED FOR COMMON STANDARDS

By NORMAN H. DAVIES, A.C.A.

THE paper plan for investing the State with the ownership of all the assets of our industry will shortly become a reality. Very soon we shall watch the overstepping of those hitherto sacred boundaries which in the past have marked the borders of our statutory areas of supply. Individual distributive systems will gradually become merged into larger unities. Integration of all the resources of manufacture, distribution, and accounting within very large areas will become not merely possible but imperative. The multiplicity of small manufacturing stations will gradually give way to the emergence of larger works.

The physical link-up of distributive systems will obviously require as a pre-requisite the adoption of a common calorific value in order that a single standard may be set for the area or portion of the area involved. For precisely the same reason, the systems of accounting which prevail within an area must be unified with a view to the production of figures which do not require re-interpreting by the area accounts office to which they are periodically submitted. The prospect of having to conform to a standard pattern—particularly if it is not one's own favourite pattern—in the matter of accounts will undoubtedly cause a lot of hackles to rise, but obviously it must be done. It is to be hoped that any decisions which are made as to the kind of records which require to be maintained will be based on the relative efficiencies of existing systems and not on the relative sizes of the undertakings in the area.

If it is an obvious requirement of area administration that the figures by which the area periodically gauges its achievements in monetary terms should be standardized, it is equally necessary for a National Code of accounting principles to be adopted without delay in order that the area results may be made truly comparable.

In 1944 the member companies of the London Gas Association undertook to investigate the possibility of unifying the compilation of accounts and statistics. The outcome of this investigation was the issue of an agreed report by the companies concerned, setting out in some detail the type of expenditure which should be charged to each heading of the Revenue Account and prescribing new lay-outs for the figures relating to Capital Expenditure and the Statement of Assets and Liabilities in the balance sheet. The general adoption in London of this report has had the effect of producing final accounts which are superficially made according to the same pattern. This similarity of design in the general appearance of the finished article should not blind one to certain fundamental differences which the companies have followed individually in regard to the treatment of quite important matters of accounting.

This becomes distressingly obvious if one tries to make any comparison between companies of the relative values of their assets as shown by their final accounts, or even of the major charges against Revenue for important items such as those for the Repair, Maintenance, and Renewal of Buildings and Plant, Mains and Services, Meters and Appliances. By far the most important of these is the charge which we all too familiarly know as Works Maintenance, a term which in itself is decidedly misleading, ignoring as it does the charges which arise out of the ever more costly schemes of reconstruction and replacement.

The Chairman of the Gas Council has said very rightly that the revenue of an undertaking must be adequate not only to cover running repairs, general maintenance, dividends, and interest, but also the eventual cost of renewing every asset of the undertaking. It is in regard to the treatment of the figures relating to these renewals that there appears to be no consistent body of thought.

Section 41 of the Gas Act, 1948, lays down that the Area Boards shall so exercise and perform their functions as to secure that the revenues of the Boards are not less than sufficient to meet their outgoings properly chargeable to revenue account taking one year with another. The opening sentence of Section 49 of the Act imposes a duty on the Area Boards to make proper provision "in every year" for all charges which are proper to be made to Revenue Account. These charges include "proper provision for depreciation of assets or renewal of assets," and it is surely a matter of fundamental importance that the treatment of these figures should be consistent throughout the industry.

Shall depreciation be the method of making provision or shall the probable cost of renewal be the guide as to how much should be provided for in the accounts ? In a world of stable prices the size of the figures to be provided for would be the same whichever of these two methods were adopted, but in a world of mounting costs and particularly in an industry in which the renewal of important pieces of plant only takes place after long intervals of time, the question is one of more than academic interest.

In the last analysis it becomes a matter of high policy as to whether current revenue should only be burdened with charges sufficient to write off capital costs incurred many years ago or should be made to bear charges calculated so as to provide a renewal fund adequate to meet the cost of renewals as and when they arise.

The recently published references to the completely autonomous nature of the Area Boards emphasize the need for a common national policy in dealing with this question.

LIQUID PURIFICATION*

By JAMES J. PRIESTLEY, M.Sc., M.Inst.Gas E., A.M.I.Chem.E.,

(W. C. Holmes and Co., Ltd.)

IN recent years there has been a marked revival of interest in the liquid purification of coal gas from hydrogen sulphide. This interest has been growing for some time for various reasons, but has been thrown into sharper focus by large-scale experiments recently carried out in this country. This paper attempts to study the fundamental principles of liquid purification, to assess its merits, the present state of development, and discusses some of the problems involved in design and operation. Approximate costs of various commercial processes are discussed. The results of some of the development work carried out at Mirfield on some aspects of the "Manchester" process are recorded.

Oxide Purification To-day

The production and purification of town gas is essentially a continuous and complex chemical engineering process, divisible into several subsidiary processes. Most of these have been developed to a point where they are continuous and in many cases automatically controlled. A simple example is the extraction of ammonia by counter current washing with water. The principle has been extended further in some instances to enable semi-finished products to be made, in our example the working-up of crude liquor to a saleable concentrated liquor. Ammonia, then, is handled automatically and continuously from the crude gas to the concentrated liquor storage tank.

The exception to the general rule is oxide purification. This has remained a batch process, in which no semi-finished product is made, ever since its inception about 1850. There are, of course, several very sound practical reasons why such a process has been retained for so long.

Oxide purification has survived as a working process for nearly a hundred years for the following reasons:

(1) Reliability of operation to meet the high standard of gas purity demanded by law.
(2) The simplicity and cheapness of the plant.
(3) The simplicity and cheapness of the operation.

Considerable improvements have been made in recent times to the original process, mainly in mechanical handling of the oxide. The most notable improvement was the introduction of tower purifiers which avoided the peak demand for labour for emptying and refilling required by the orthodox type boxes. Note that even this advance does not dispense with, but evens out the demand on labour.

Mechanization of oxide purification is admittedly very difficult. The solid to be handled is of a variable consistency, is highly corrosive to metal, and changes from a moist granular to a hard rock-like condition in use. Contrasting the two gas-works processes in which large weights of solids are handled—oxide purification and coal carbonization—the difference in the degree of mechanization achieved becomes immediately apparent. On a modern coking plant, producing 10 million cu.ft. of gas per day, involving the moving of 900 tons of coal (and the coke produced from it), 18 men will do all the handling, from the coal bunkers to the coke wharf, each man, therefore, handling 50 tons of coal (and the coke produced from it) per day (1). Even with modern tower type purifiers this figure cannot be approached.

Because of changes which have taken place during and since the war, the inevitability of oxide purification is being questioned, and alternative means are being studied. This has not arisen primarily because of academic disapproval of, from the chemical engineering viewpoint, a relatively crude process, but because of sheer necessity.

The reasons for this are well known but may be stated briefly:

(1) Cost and difficulty in obtaining labour for emptying and refilling oxide boxes of the orthodox type constituting the majority of purifiers at work in this country.
(2) Increasing difficulty in disposing of spent oxide, other than by tipping or dumping.
(3) High cost and long delivery of new box purifier installations.
(4) Increasing demand for gas.

It will be seen that these reasons largely offset those stated as being responsible for the longevity of oxide purification. Reliability of operation remains unchallenged, but the process, plant and operation are neither as simple nor as cheap as they were.

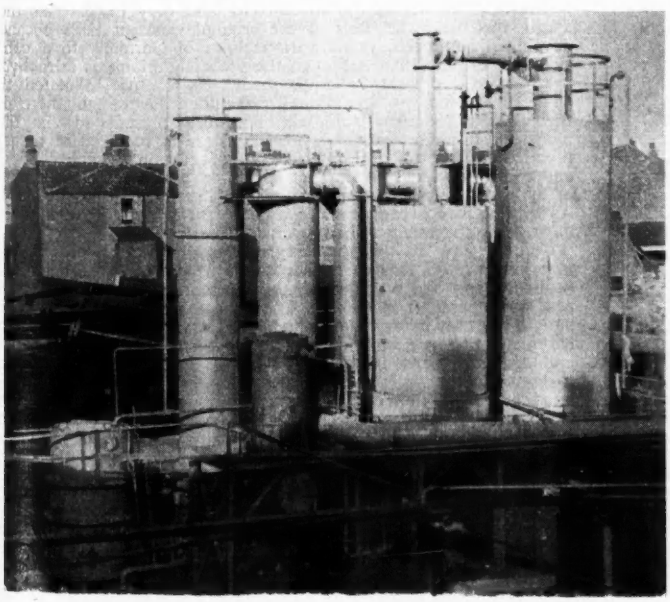
The Role of Liquid Purification

The simplest way to mechanize hydrogen sulphide removal is to substitute a liquid for a solid process. This substitution means, in effect, mechanization by the installation of pumps, the labour problem thus being alleviated if not eliminated. Secondly, the problem of disposal of spent oxide is dispensed with, as the sulphur recovered in liquid purification can be worked up into a high-grade saleable product. Thirdly, the capital cost of a liquid purification plant is less than that of a set of oxide boxes for the same duty, provided that duty is not too small. Finally, a liquid purification plant may be made to be extremely flexible, handling heavy over-loads where required.

There are disadvantages associated with the processes which will be discussed later.

Starting with the work of Feld, a considerable amount of time and energy has been devoted to the problem. Over 360 patents have been granted in this field alone, and one's impression when encountering the literature on the subject for the first time is one of complete bewilderment. There are, however, broad fundamental principles underlying virtually all the different processes, and it is with these we shall deal.

In this country large-scale work was carried out at various works. The Claus ammonia process for complete hydrogen sulphide removal was operated on a full scale for three years here in Birmingham, and described by Mr. Charles Hunt in 1886 (2). Further work was carried out by Davidson and Smith from 1910 to 1914. Cobb (3) operated the zinc process at Leeds and about the same time (1929), experimental work on the scale of 2 million cu.ft. of gas per day was carried out on the Burkheiser process at Bournemouth (4). Cook, at Southport (21), treated a stream of one million cu.ft. of gas per day, and achieved a 50% hydrogen sulphide removal by sodium carbonate washing. One interesting development of more recent date is the "Manchester" process plant at the Rochdale Road works of the Manchester Corporation. Abroad several large plants of various types are in successful operation. Of these the "Thylox" process of the American Koppers Corporation is most widely used, and it has been stated (6) that in



General view of Holmes' experimental liquid purification plant (Manchester process) at the works of the Mirfield Gas Company.

* Paper to the Midland Junior Gas Association, Jan. 18, 1949.

1945 a total volume of 266 million cu.ft. of gas per day was being treated in Thylox plants alone.

Complete and Partial Purification

There are at least two schools of thought which differ as to which is the best way of using a liquid purification plant. The first (7) believes that liquid purification should be used solely to ease the load on existing box purifiers, particularly during high winter loads. In this scheme absorption towers would be placed before and in series with existing boxes, no attempt being made to remove the hydrogen sulphide completely in the absorption towers. In fact it is considered better to allow sufficient hydrogen sulphide to slip to keep the boxes active. In this way a liquid purification plant may be regarded in one of two ways. Operating continuously it enables additional base load to be carried without the full extra capital expenditure. Alternatively, it becomes a peak load plant in a manner analogous to a carburetted water gas plant.

Others (8) hold that complete removal is to be aimed at, and can actually be done, the liquid purification plant replacing, not supplementing, box purifiers. This is much more difficult of accomplishment and indeed rules out certain processes as being physically incapable of achieving the Gas Referees' standard of purification. In this connexion it is probably not inappropriate to say that the Gas Referees' standard is extremely severe and seems unwarrantable, when one remembers that up to 35 grains per 100 cu.ft. of sulphur as organic sulphur compounds are regularly distributed in town gas which will not stain a lead paper.

Fundamental Principles

Virtually, all modern processes may be classified into one of the two following groups:

(*a*) Absorption by a hydrogen sulphide solvent, followed by desorption of the hydrogen sulphide.

(*b*) Absorption and oxidation of the hydrogen sulphide to sulphur or thiosulphate or both.

There is a third group which may be classified separately:

(*c*) Absorption and fixation of the absorbed hydrogen sulphide with sulphur dioxide and ammonia.

(*a*) *Absorption and Desorption of Hydrogen Sulphide* (Fig. 1).

Simple water washing will remove hydrogen sulphide, but the solubility of hydrogen sulphide in water is relatively small, such that a theoretical water rate of about 3,000 gall./1,000 cu.ft.

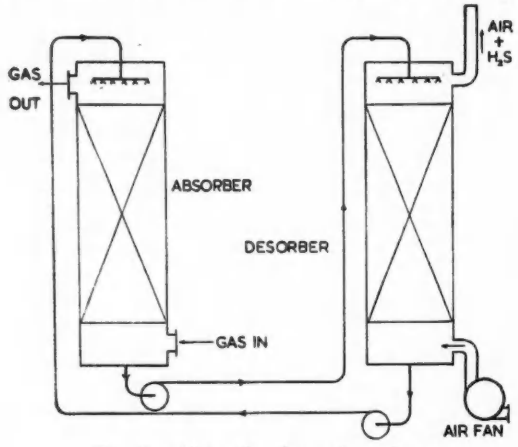


Fig. 1.—Absorption-desorption plant.

would be required to remove it. Such water rate would, of course, not be practical. Hydrogen sulphide is ionized in solution thus:

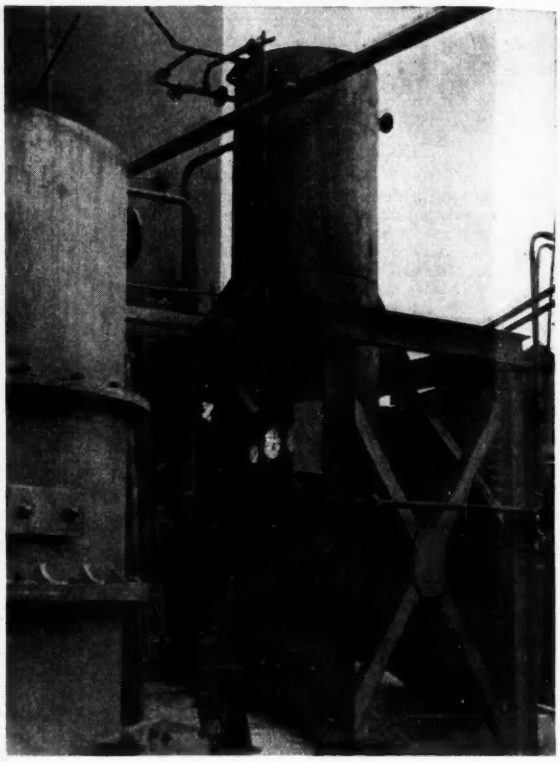
$$H_2S = H^{\cdot} + HS'$$

and the unionized hydrogen sulphide is in equilibrium with that in the gas. If now we reduce the concentration of unionized hydrogen sulphide in solution by increasing the ionization, the equilibrium concentration in the gas phase will also be reduced. This means that the hydrogen sulphide would have a greater solubility and correspondingly less water would be required to remove it. If, for instance, one-hundredth of the total hydrogen sulphide in the solution were in the form of unionized hydrogen sulphide, the solubility of the hydrogen sulphide in the solution would be one hundred times greater than the normal solubility of this gas in water. The dissocation constant of hydrogen sulphide K_{H2S} may be expressed:

$$K_{H_2S} = \frac{(H^{\cdot})\,(HS')}{(H_2S)}$$

or

$$\frac{(H_2S)}{(HS')} = \frac{H^{\cdot}}{K_{H_2S}}$$



Autoclave or pressure separator.

From the second equation, we may see that the ratio of concentration of unionized to ionized hydrogen sulphide, essentially $\frac{(HS')}{(H_2S)}$, is reduced by reducing $(H^{\cdot})$. the concentration of hydrogen ions in solution. If now an alkaline material is added. which will have this desired effect of reducing $(H^{\cdot})$, the solubility of hydrogen sulphide is increased thereby. If, for instance, an alkali is added until the *p*H is approximately 9.0, the solubility of hydrogen sulphide is increased one hundred-fold.

This is the basic principle utilized in the absorption/desorption group processes. In general a solution of either (*a*) a weak base, or (*b*) a salt of a strong base and a weak acid, is used. Ammonia is the best known of the weak bases and may be used as the alkali, this being the basis of the original work of Hills (9) and developed commercially on various lines in Germany to a considerable extent (10). Although the use of ammonia is attractive, in that it is present in crude coal gas, its use is stated to be accompanied by operational difficulties. Although there is theoretically sufficient ammonia normally present to fix the hydrogen sulphide normally present, more is required in actual practice because of the interference of carbon dioxide. Short and controlled times of contact to obtain preferential absorption of hydrogen sulphide as against carbon dioxide have to be used. As alternatives to ammonia, many of the strong organic bases have been suggested as being suitable.

Coming now to the second group, sodium carbonate is the best known. Sodium carbonate solutions are used both in the Seaboard and Vacuum Carbonate processes. The Seaboard process was operating in the U.S.A. on a commercial scale in 1920, and in 1942 over fifty plants had been built. The usual sodium carbonate liquor circulation quoted by Sperr (11) is between 60 and 150 gall. per 1,000 cu. ft. of gas. In addition to sodium carbonate, other alkali carbonates, borates, phosphates, phenolates, phenol-sulphonates and amino compounds may be used (6).

Absorption and desorption processes have a disadvantage to set against their relatively simple operation, in that hydrogen sulphide absorbed in one half of the cycle is desorbed in the other half as hydrogen sulphide. In other words, a physical separation of hydrogen sulphide is effected, and its disposal may be a matter of some difficulty. In the Seaboard process, for instance, the hydrogen sulphide is removed from the fouled solution by air blowing, to atmosphere, a practice which would not be allowed in this country. Unless some use is made of the hydrogen sulphide—*e.g.*, sulphur or sulphuric acid manufacture, it becomes an embarrassment.

(b) *Absorption and Oxidation* (Fig. 2).

If, instead of merely absorbing hydrogen sulphide in solution,

it is oxidized to free sulphur, the disposal problem is solved. This may be done by a variety of oxygen carriers, but the fundamental principle is the same and is the basis of the second group of liquid purification processes. After absorption hydrogen suphide is oxidized:

$$H_2S + 2O_2 = H_2O + S.$$

The basic design of the plant is the same, and any of the absorption solutions used by different processes may, within reason, be used in that plant. The two main parts are: (1) the absorption stage, (2) the oxidation stage.

In the first, hydrogen sulphide is absorbed and allowed to react with an oxygen carrier. This is itself reduced and passes on to the second stage, where it is restored to its original condition and free sulphur liberated.

The best known of the large-scale liquid purification processes are included in this group. The Ferrox, Gluud, and Manchester processes use ferric hydroxide as the oxygen carrier, and the reactions taking place are similar to those taking place in the box purifier. Hydrogen sulphide is absorbed in ammonia or sodium carbonate solution to form an alkaline hydrogen sulphide. This in turn reacts with the ferric hydroxide to form ferric sulphide. In the oxidation stage, air is blown through the solution and the ferric sulphide oxidized to ferric hydroxide and free sulphur.

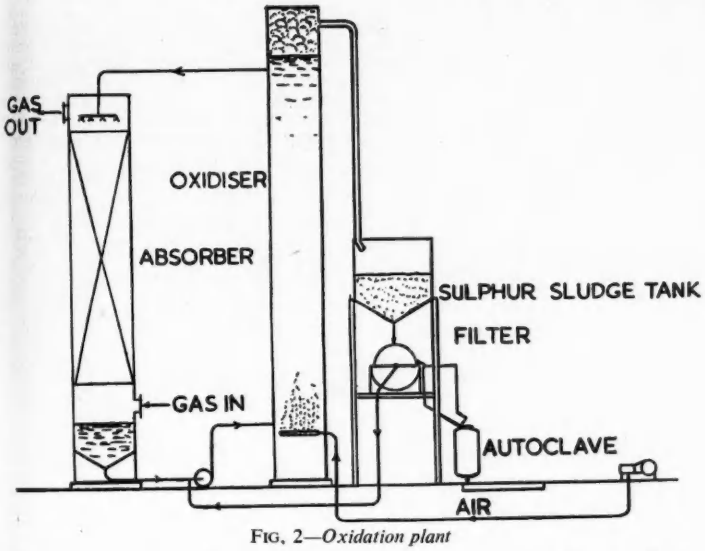


FIG. 2—*Oxidation plant*

(*a*) $H_2S + Na_2CO_3 = NaHCO_3 + NaHS$.
(*b*) $3NaHCO_3 + 3NaHS + Fe_2O_3 = Fe_2S_3 + 3Na_2CO_3$.
(*c*) $2Fe_2S_3 + 3O_2 = 2Fe_2O_3 + 6S$.

The Ferrox process uses soda as the alkali, Gluud uses ammonia, and Manchester both.

In the SMO (Staatsmijnen-Otto) process (12) and the very similar Auto process (13) (14), the washing medium is a suspension of Prussian blue in dilute ammonia solution. By Prussian blue is meant the complex iron cyanide in which the iron is partly in the ferric and partly in the ferrous condition.

$$Fe''\ \underset{(CN)_3}{\overset{(CN)_3}{}}\ Fe'''$$

The basic reactions are:

(1) $2Fe''' + H_2S = 2Fe'' + S + 2H^{\cdot}$
(2) $2Fe'' + \frac{1}{2}O_2 + H_2O = 2Fe''' + 2OH$ (6) (15).

In the Thylox process a solution of a thioarsenate (ammonium or sodium) containing about 5% arsenic as As_2O_3 is used. Again the mechanism is the same.

(1) $(NH_4)_3\,AsO_3S_3 + H_2S = (NH_4)_3\,AsOS_2 + H_2O$.
(2) $(NH_4)_3\,AsOS_3 + \frac{1}{2}O_2 = (NH_4)_3\,AsO_3S_2 + S$.

In all cases the sulphur is formed as a finely divided suspension in the oxidation vessel.

(c) *Absorption and Fixation.*

A self-contained process in which ammonia and hydrogen sulphide are extracted together has been the subject of a great deal of work. Instead of oxidation to sulphur, hydrogen sulphide is oxidized to thiosulphate, later to be converted to ammonium sulphate and sulphur. The Katasulf process, based on these lines, was operating before the war in the Ruhr on a scale of 25 mill. cu.ft. of gas per day (16). Here hydrogen sulphide and hydrogen cyanide in crude gas were converted by catalyst treatment to sulphur dioxide and ammonia respectively. The ammonia present was unchanged. By addition of some ammonium sulphide, the final products were ammonium sulphate and sulphur.

Choice of a Process for British Gas-Works Operation

The choice of a liquid purification process is influenced by various factors, such as:

(1) Quantity of gas to be treated.
(2) Degree of hydrogen sulphide removal required.
(3) Whether it is to operate as peak load or base line plant.
(4) Form in which recovered hydrogen sulphide is required.
(5) Means available for removal of liquid and gaseous effluents.
(6) Capital cost of plant.
(7) Cost of operation of plant.

The absorption/desorption group is, as far as British practice is concerned, ruled out for either peak load or continuous operation unless adequate means are at hand to handle the hydrogen sulphide produced in the desorption.

Of the oxidation group, all are suitable for peak load operation. By careful design of the absorbers these may be operated in a position preceding the oxide purifiers, to remove any desired amount of hydrogen sulphide from the gas, leaving the remainder to be handled by the purifiers. The load reduction is one of hydrogen sulphide only, not of gas volume. If existing purifiers are inadequate to pass the gas volume without appreciable pressure loss, it may be considered advisable to put a liquid purification plant in parallel with them. In this way a volumetric load reduction with a proportional reduction of hydrogen sulphide passing to the purifiers, is achieved. Worked in this way, however, the liquid purification plant would have to be capable of a much more efficient performance than it would when working in series. It would have to be capable of complete, or nearly complete, removal of hydrogen sulphide depending on whether catch boxes were available. In other words, the plant would have to be identical with one designed for continuous operation.

Complete and continuous removal of hydrogen sulphide is, of course, the most arduous duty that a liquid purification plant may be expected to perform. Not all the well-known oxidation processes are able to achieve complete removal to Referees' standard. The Thylox process is a case in point. The reason for this is simply that the oxidized solution has a vapour pressure of hydrogen sulphide corresponding to 0.2 to 0.3 grains H_2S/100 cu.ft. gas ((6), p. 976). Most Thylox plants are designed for about 95% removal of hydrogen sulphide, the reason for this being probably one of economics.

The Ferrox/Gluud/Manchester and the SMO/Auto types of plant are, at any rate in theory, capable of complete removal, as the hydrogen sulphide is passed on to an insoluble compound (ferric hydroxide or blue) out of the field of reaction.

Whether the removal of final traces of hydrogen sulphide by liquid means is economically justifiable is not at this stage known.

Factors Influencing Plant Design

This will deal mainly with oxidation group plants, and includes original work on certain aspects of liquid purification carried out by W. C. Holmes & Co., Ltd., at Mirfield, as licensees of the "Manchester" process.

The four basic factors to be studied in designing a liquid purification plant of the oxidation type may be stated thus:

(1) Absorption.
(2) Oxidation.
(3) Sulphur disposal.
(4) Effluents.

To these may be added a fifth, very important if the plant is to purify continuously to Gas Referees' standards, namely, (5) ensured continuity of operation.

(1) *Absorption.*

The fundamental principle of the use of an alkali to increase the solubility of hydrogen sulphide in water has already been described. Although fundamental to all three main oxidation processes, these observations will be concerned mainly with the SMO and Ferrox groups. Counter-current or nearly counter-current washing is, of course, necessary. Once the fundamental equilibrium data are obtained, the usual equations such as are used in other washing problems may be used for design. The problem is complicated by the presence of carbon dioxide (and to a less extent hydrogen cyanide) in the gas. Not only has the equilibrium between hydrogen sulphide and an alkaline solution to be considered but also between carbon dioxide and the solution. Moreover, the carbon dioxide is present in larger quantities, although less soluble than hydrogen sulphide. Solutions of sodium carbonate rapidly become changed to sodium bicarbonate $NaHCO_3$. The ratio of the two carbonates present in a circulating solution will depend on the

carbon dioxide concentration of the gas and on the time of contact of the solution with the gas. Laboratory determinations were made of the equilibrium concentrations of hydrogen sulphide in a crude gas and a solution of sodium carbonate and a solution of sodium bicarbonate. In order not to change the nature of the carbonate solutions, carbon dioxide was removed entirely. The results are given for sodium carbonate:

Equilibrium of Hydrogen Sulphide between Crude Gas and Sodium Carbonate Solutions. Temperature 65° F. CO_2 removed.

Normality Na_2CO_3 solution at start	H_2S in gas gns./100 cu.ft.	H_2S in liquid at equlibrium gm./100 cc.	Normality
0.125 N	755	0.43	0.25
0.25 N	610	0.59	0.35
0.80 N	730	1.50	0.88
1.00 N	720	1.70	1.00

These figures show that with, for instance, 0.25 N Na_2CO_3 solution, a theoretical flow of 3.06 gall./1,000 cu.ft. of gas will remove all the hydrogen sulphide. In practice, considerably higher rates of flow have to be used because of the time required to achieve equilibrium. Although there is no experimental confirmation to hand it is more than probable that the liquid film even reduced in its effective resistance by the presence of the carbonates controls the rate of hydrogen sulphide absorption the gas film playing a negligible rôle.

The next stage is the reaction between the alkaline hydrosulphide and the "oxygen carrier." If this is hydrated ferric oxide as in the Ferrox and Manchester processes, hydrated ferric sulphide is formed. This reaction is stated (5) to proceed slowly and the "Manchester" plant has a delay tank following the absorbers to allow this to go to completion, although the Ferrox plant has none. There is no delay tank used in the SMO plants either at Tertre or Billingham.

Our large-scale experiments using hydrated ferric oxide lead us to believe that part of the hydrogen cyanide normally absorbed is converted to blue and actually assists in "oxygen carrying" as in the SMO process. This was most noticeable in that fresh alkaline ferric hydroxide suspension was not as efficient as one which had been in use for three weeks, other conditions remaining unaltered. Our experiments have shown that satisfactory operation is achieved with a concentration of $Fe_2O_3H_2O$ of 1,000 mg./litre of suspension (*i.e.*, 0.1%).

Grid-packed towers have been used in large-scale absorbers though at irrigation rates of less than 500 gall./hr./sq.ft. tower area they tend to accumulate a deposit consisting largely of ferric sulphide and sulphur.

In this connexion it is interesting to note that Fischer ((6), p. 973) found when working a process of hydrogen sulphide removal that sulphur had a pronounced tendency at the instant of formation to adhere to surfaces. Whether it is a similar effect taking place in our absorbers is not known.

Oxidation

Efficient oxidation is vital to the performance of a liquid purification plant as the cost of air compression can be the largest single operating cost on the plant. The cause of this is the relatively low solubility of oxygen in water or of aqueous solutions normally used. Of all the resistances to the transfer of oxygen from the gaseous phase to the field of reaction with ferric sulphide, the liquid film resistance is by far the greatest and the liquid film is said to be controlling. In other words, the rate of transfer of oxygen is governed by its rate of diffusion through the liquid film. For this reason bubble type oxidizers are used as it is in these that the resistance of the liquid film is reduced to a minimum, a given bubble of oxygen (or air) being allowed to ascend rapidly past fresh surfaces of liquid. The fundamental equation for this type of transfer may be stated (17).

$$\frac{dQ}{dT} = k_L A (C_g - C_L)$$

where

$\frac{dQ}{dT}$ = rate of oxygen absorption.
k_L = individual diffusion coefficient through gas film.
A = area of inter-face.
C_g = concentration of oxygen in gas.
C_L = concentration of oxygen in body of liquid.

It will be seen that to obtain a maximum transfer rate, A, the area of interface and $(C_g - C_L)$ should be as large as possible. Considering A first; to obtain a large surface the air should be split up into bubbles, as small in size and as numerous as possible, without undue expenditure of power. Porous pots and reinforced canvas bags have been used, but these tend to block after a time with precipitated sulphur. Porous pots, in addition, absorb quite a considerable pressure before the air breaks through the pores. We have adopted what we term a "rotary diffuser" which seems to operate very satisfactorily. This is shown in Fig. 3. Air is blown under a hood, resembling a large bubble cap, in the sides of which are cut slots or holes. The hood is rotated and the escaping bubbles are sheared off to a very small size. This is economical in power as there is no "break through" pressure absorption, the only other major power absorption being in the skin friction between the hood and the liquid. Baffles are inserted to prevent swirl in the liquid, which interferes with the wide distribution of the bubbles. On our plant such a device has worked at 375 r.p.m. for six months and has given no trouble.

Turbo diffusers are widely used in the U.S.A. for similar duties (Fig. 4). They are similar to our device in construction except that they are designed not merely to produce bubbles in a stationary mass of liquid, but to agitate the liquid as well, both air and liquid being thrown outwards against a stationary deflecting guard ring. This is claimed to increase the transfer rate, as the factor k_L in the above equation is not constant, but varies approximately as the 0.8 power of the relative velocity of the air and the liquid. It is open to question whether the higher transfer rate achieved justifies the extra power consumed.

Considering now the term $(C_g - C_L)$, as C_L is negligible it follows that for maximum transfer C_g, or the concentration of oxygen in the gas, should be as large as possible. Our own experiments indicate that oxidation goes nearly five times as fast when oxygen is used as with air. This is deducible from Henry's law and, moreover, confirms that oxygen is used up by the reaction as fast as it is dissolved. Although tall oxidation towers achieve a greater rate of transfer by virtue of the increased average partial pressure of oxygen, the compression cost is proportionally increased. Shallow oxidizers, using air more inefficiently and operating virtually at atmospheric pressure, are at the other end of the scale and it is hardly possible to calculate the optimum depth without a sound basis of experimental results. We have compromised, mainly for reasons of economy on an oxidizer 20 ft. deep.

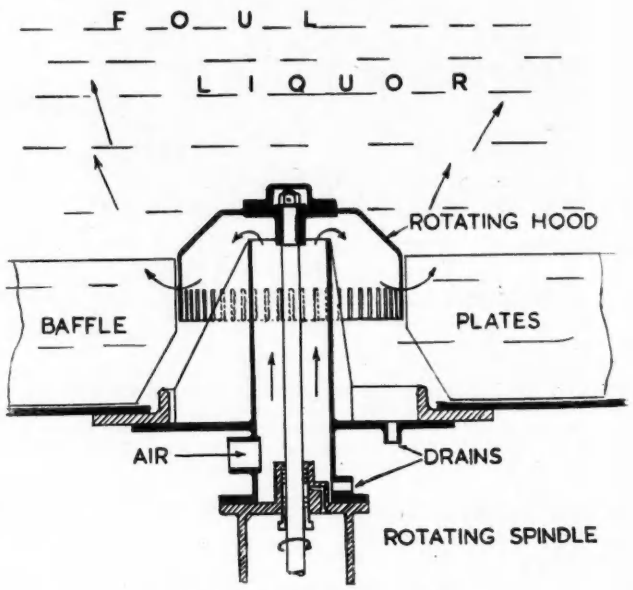


FIG. 3.—*Rotary diffuser.*

Just as the solubility of hydrogen sulphide may be increased by the use of soda, so can the solubility of oxygen be increased by other substances. Our own laboratory results of theoretical interest only show that pyrogallol, and the dihydric phenols hydroquinone and catechol, in that order, will accelerate oxygen absorption. Cobalt naphthenate is a more practical proposition being a material commonly used to catalyze atmospheric oxidation, but this has not yet been tried thoroughly.

Sulphur Disposal

The elemental sulphur formed in the oxidizer is in an extremely fine state of sub-division. In the Gluud, Ferrox, SMO, and Thylox processes the sulphur is floated off as a froth from the surface of the oxidizer, carried up there by the rising bubbles of air. This froth is then filtered and washed, then either dried or treated in autoclaves to melt the sulphur. At Manchester a bleed of circulating liquor is passed through a filter press and the sulphur recovered as filter cakes.

It is extremely difficult to reduce the water content of sulphur paste below 60% moisture by vacuum filtration. In order to make the material fit for handling, let alone selling, further treatment is necessary.

The two lines of attack we are developing at Mirfield are, firstly, film drying, and, secondly, autoclave treatment. In film drying, the crude sludge is applied in a thin film on to the surface of a steam-heated metal cylinder revolving around a horizontal axis (Fig. 5). Heat is transferred to the sludge from the condensing steam in the interior of the drum. The dried product is removed, after travelling as far round the drum as possible, by a "doctor" knife set close to the drum surface. The product is in small thin flakes. The water vapour evaporated from the drum is removed by an air current and discharged preferably into a flue or chimney. Tests made on crude sulphur sludge showed that a satisfactory final product could be made with a steam consumption of 12 lb./gall. crude sludge treated.

The so-called autoclave treatment is really a pressure separation of sulphur from the bulk of the water and impurities associated with it in the crude sludge. These impurities consist mainly of insoluble bodies such as ferric hydroxide and iron cyanide complexes and soluble salts such as ammonium and sodium carbonate, bicarbonate, thiosulphate, thiocyanate and sulphate.

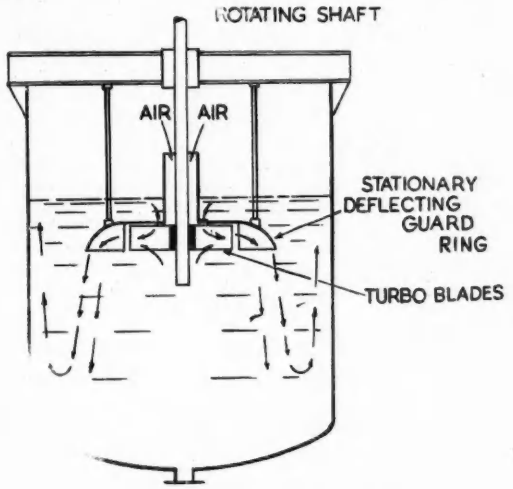


FIG. 4.—*Turbo-diffuser.*

Crude sludge is pumped into a cylindrical vessel, vented by a safety valve set at 30 p.s.i., having a conical bottom (Fig. 6) and heated to a temperature above the melting point of sulphur. This may be done by a steam jacket, in which case the sulphur in the paste melts and coagulates, and sinks to the bottom of the vessel. Experiments have shown that if the sulphur (plus tar) content of the coagulated mass is much below 70% (dry basis) it will not assume a true liquid form, and can only be extracted from the vessel with difficulty. If, however, open steam is used as an alternative or addition to jacket steam, experiments show that the insoluble impurities are gradually stripped out of the sulphur by the ascending current of steam, and carried up into the aqueous layer until finally the sulphur is relatively free of insoluble impurities. This is due to the fact that, whereas the finely divided sulphur particles coalesce to form larger and larger particles, which sink in the aqueous layer, the insoluble (and also infusible) impurities retain their original size and as a consequence remain suspended in the aqueous layer, assisted by the agitating action of the open steam. By this treatment a purer sulphur, which could be discharged with ease through a cock at the bottom of the vessel, is produced. Average results are as follows:

	Sludge treated	Sulphur produced
% moisture	69.8%	2.61%
On a dry basis :		
Sulphur and tar	79.2%	97.3%
Fe_2O_3	20.8%	1.2%
Remainder	Nil	1.5%

At the end of the sulphur discharge liquid bearing ferric hydroxide appears. This is then blown out through a separate line to an overhead settling tank.

The sulphur produced by this treatment is usually rather spongy due to water entangled with the sulphur evaporating to steam during discharge. A final stage is added in which the sulphur is discharged into a large steam jacketed discharge pipe. The small proportion of entangled water is evaporated and passed out through a vent. The dehydrated sulphur runs down the pipe and out through a discharge hole to be treated as required. For large-scale plants the sulphur could be run in a thin layer on to a water-cooled stainless steel belt, solidified and cracked off as the belt turns around the end roller.

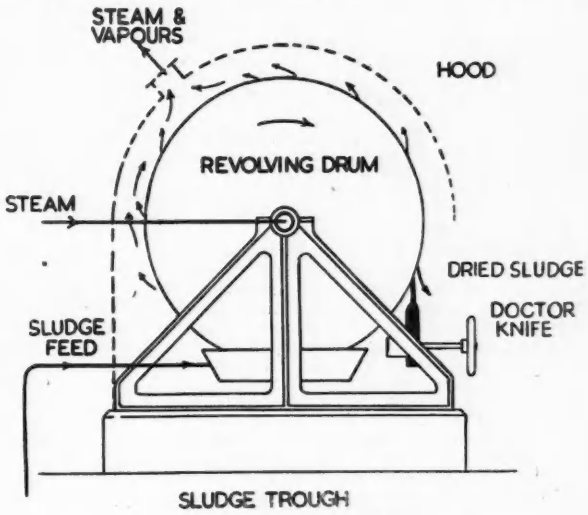


FIG. 5.—*Film drier.*

Effluents

In order to prevent the undue accumulation of thiosulphates and thiocyanates in a liquid purification circulating medium, a portion has to be bled off from time to time. This constitutes a serious effluent problem. In the processes previously mentioned hydrogen cyanide is removed almost completely, first as ammonium or sodium cyanide, and during the oxidation cycle with free sulphur present to thiocyanate. Thiosulphates are formed similarly. As far as the sewage works is concerned, thiocyanates are by far the worst, as thiosulphates oxidize fairly easily. In the elaborate liquor effluent treatment process described by Nicklin (18) the thiosulphate/thiocyanate content was recovered as a concentrate. A similar method might be applicable to liquid purification effluents but would add to the cost of hydrogen sulphide removal.

By careful operation it is possible to keep down the volume of effluent and reduce the fresh water input (with fresh reagents) equal to that going out with the crude sulphur paste. Film drying of the sulphur has the advantage of producing no liquid

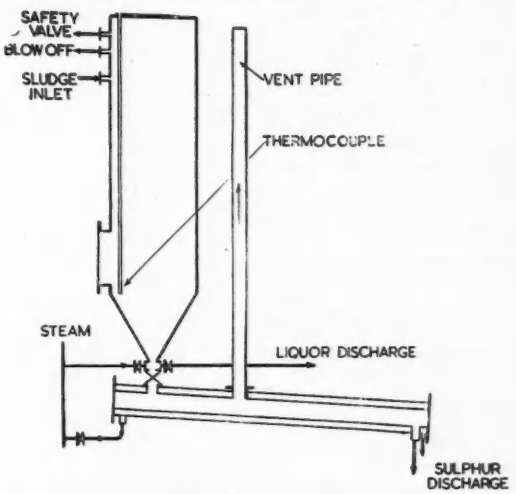


FIG. 6.—*Pressure separator.*

effluent, the soluble salts being crystallized out and discharged with the sulphur. The autoclaving or pressure separation of the sulphur sludge does not appreciably increase the toxicity of effluent. On our own plant, the O/A of both circulating and autoclave liquor were about the same, namely, 1,500 to 2,000 p.p. 100,000. During treatment sodium sulphate rather than thiosulphate is formed.

The problem of effluents is as yet virtually untouched, but sooner or later it will have to be faced.

Cooper and Henshaw (19) pointed out that the most serious deterrent to installation of liquid purification is the risk of breakdown. This applies equally to a peak load or complete removal plant. Duplication of plant and means of power supply is probably the only sure safeguard against this. Another difficulty is the immediate realization of breakdown by the operator so that the duplicate unit may be put to work at once. In some instances, such as failure of an electric power supply, this can be made automatic. In such an event a no-volt mechanism may be made to close a battery-operated circuit, bringing into commission an alternative prime mover, such as a diesel engine or steam turbine. The installation of an automatic clutch would enable the alternative prime mover to run up to speed before coming on load. Such an arrangement is standard practice in marine engineering.

It is extremely difficult to compare costs of liquid purification processes with each other and with oxide purification. Speaking of pre-war conditions, Foxwell and Grounds (20) quoted 2 mill cu.ft. gas per day as the absolute minimum duty for a Thylox liquid purification plant if it is to compete with oxide boxes on purely economic grounds. For reasons quoted at the beginning of this paper, this figure is hardly likely to be a hard and fast rule to-day. Nevertheless, they showed that (in 1939) with a given hydrogen sulphide concentration of 500 grains per 100 cu.ft., Thylox plants could treat 15 mill. cu.ft. per day at a net cost of .066d. per 1,000 cu.ft., whereas when treating 35 mill. cu.ft./day the net operating cost was nil. Net figures are not always obtainable, but some gross costs of operation were cited.

Regarding the Manchester process, it should be pointed out that, firstly, this plant is believed to be the only one purifying down to statutory limits of hydrogen sulphide removal, which may account for the higher power consumption. A large portion therefore, of the cost may be said to be expended in removing the last few grains of hydrogen sulphide which, in the case of the other three plants, is not removed. Secondly, the plant is small in comparison with the others which usually means that operating costs are relatively higher.

No up-to-date costs of the Thylox process are available, but it should be noted that in the United States all plants working on the Ferrox process have been modified by Koppers to operate on the Thylox process. It is believed the change was due to economic reasons.

Undue emphasis should not be placed on costs of liquid purification at this stage of development. The application, in this country at least, is new and the working-up of by-product sulphur scarcely begun. A point of great importance, which should always be borne in mind, is that problems of purification to-day are not solely economic, as was pointed out earlier in this paper, but are related to a wider field of changing conditions outside the industry.

The writer is indebted to the Directors of W. C. Holmes & Co., Ltd. for permission to publish experimental work quoted in the paper, and the Directors of the Mirfield Gas Company for the many facilities granted at their works; also to Mr. James Edgar, Works Superintendent, Mirfield Gas Company, and the members of Messrs. W. C. Holmes' Research and Development Staff.

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STOURBRIDGE EXTENSIONS DELAYED

Complaints about the delay of the Ministry of Fuel and Power in giving approval to Stourbridge Town Council to proceed with the erection of retorts on ground already owned by the Gas Department were made at a Council meeting on Jan. 31. Councillor F. G. Gregory (Chairman of the Gas Committee) said that in December, 1946, the Engineer and Manager informed the Ministry of Fuel and Power that in view of the increased demand for gas and of prospective further increases due to new housing development, and owing to the long delay in obtaining new plant, it was imperative that steps should be taken to safeguard the supply of gas for future years. From that time until now the matter had been the subject of correspondence and interviews with officers of the Ministry, but in spite of repeated warnings to the Department of the gravity of the situation which would shortly arise, it had been impossible to obtain a decision.

The old retorts were worn out and had to be patched up continually. The consumption of gas had been, and still was, steadily increasing, both for domestic supplies (including new housing estates) and for industry; and the Engineer and Manager had for some time to refuse orders for new industrial supplies. It would take several years from the date of contract before the new retorts could be operated, and the danger was that meanwhile the supply might fail or have to be curtailed. Ultimately, when the Engineer and Town Clerk visited officers of the Department in London on Sept. 8, 1948, they were informed that there was no means of getting a final decision without obtaining planning permission.

Even after the Town Clerk had obtained the planning consent, however, there was more delay. The Ministry referred the matter to the Area Board, and they passed it on to No. 9 Regional Advisory Board, which had set up a working party to consider it. Repeatedly over the last two years attempts had been made, without success, to get satisfaction, and the Committee felt that the full Council should know that everything in their power had been done to safeguard the interest of consumers, and should there be any breakdown it would not be the fault of the Council.

Councillor Gregory added that the position had improved somewhat by reason of the fact that they had received a visit from the Advisory Panel, and though their report had not been prepared, he was hopeful that it would be favourable. The Panel had been very helpful and it was hoped that a speedy decision would be made. After further discussion, the Committee's report, recommending that the matter should be brought to the notice of the local M.P., was approved.

PROGRESS OF A YOUNG ASSOCIATION

Presiding at the Annual General Meeting held recently in London of the British Industrial Measuring and Control Apparatus Manufacturers' Association, Mr. W. G. Ardley, of George Kent, Ltd., said that 1948 had been a busy year for the Association generally, and for its members individually. Although B.I.M.C.A.M.A. was a comparatively young Association, it had during its short existence made remarkable progress, and had now become well established and recognized as representing the industrial instrument industry. This progress would continue for the industry had an increasingly important part to play in furthering increased industrial productive efficiency. The demand for industrial measuring and control instruments was increasing, but so was the production of those instruments. The drive for increasing efficiency brought in its train the urge for standardization, but standardization was only of use if it actually helped to increase production generally and assisted in meeting export needs.

On relinquishing the office of Chairman, which he had held since the formation of the Association, Mr. Ardley was elected first President of the Association. Mr. H. W. Blake, of Tylors of London, Ltd., was elected Chairman, and Mr. L. S. Yoxall of Foxboro-Yoxall, Ltd., Deputy Chairman. The following were elected members of the Committee for 1949: H. W. Arkell, James Gordon & Co., Ltd.; G. H. Barker, Electroflo Meters Co., Ltd.; G. A. Edwards, Alexander Wright & Co., Ltd.; L. Pywell, Gent & Co., Ltd.: W. G. Thomas, Bailey Meters & Controls, Ltd.

At the luncheon which preceded the meeting, the principal guests of the Association were: Sir Frank E. Smith, G.C.B., G.B.E., F.R.S., Anglo-Iranian Oil Co., Ltd.; Sir Jonathan Davidson, C.M.G., Metropolitan Water Board, President of the Institution of Civil Engineers; Dr. D. T. A. Townend, D.Sc., Ph.D., British Coal Utilization Research Association, President of the Institute of Fuel; Mr. J. E. C. Bailey, C.B.E., President of the Scientific Instrument Manufacturers' Association; Mr. A. W. Angus, Director of Instrument Production, Ministry of Supply; Mr. J. B. M. Mason, late Chief Fuel Officer, Ministry of Fuel and Power; Mr. A. J. Philpot, C.B.E., M.A., Director of the Scientific Instrument Manufacturers' Association; Mr. G. P. Clay, Imperial Chemical Industries, Ltd.; and Mr. E. A. Nash, lately Secretary of the Association.

Walsall Gas Department have accepted the tender of the Woodall-Duckham Vertical Retort and Oven Construction Co., Ltd., for £843,193 for extensions to the Pleck Gas-Works.

GAS UNDERTAKINGS' RESULTS

Cleethorpes Gas Company

Dividend for the year ended Dec. 31 is 4½% on the Ordinary stock, as compared with 5% for the previous year, leaving £8,778 to be carried forward.

Great Yarmouth Gas Company

Dividend for the year ended Dec. 31 is at 4% on the Ordinary stock, leaving £11,942 to be carried forward, compared with £9,099 for the previous year.

Great Grimsby Gas Company

Dividends for the year ended Dec. 31 are at 10% on "A," "B," and "C" Ordinary stock, at 9% on £10 shares, and 4% on Preference stock, leaving £32,041 to be carried forward.

Harwich Gas & Coke Company

Dividends are to be paid for the year ended Dec. 31 at 5% on Original stock, at 3½% on Additional stock, and at 6% on Preference stock, leaving £14,963 to be carried forward, compared with £10,188 for the previous year.

Oxford and District Gas Company

The balance carried from revenue to profit and loss account for 1948 is £43,899, compared with £45,048 for the previous year. Gas sales yielded £448,803, against £363,522, and residuals brought in £228,687 against £180,812. A final dividend of 4½% makes a total Consolidated Ordinary dividend of 9% for the year.

Croydon Gas Company

Net revenue for 1948, after providing for all fixed charges and allocations of £3,300 to insurance fund and £23,500 to renewal fund was £123,766. The revenue balance carried to net revenue account was £187,103, compared with £165,391 for the previous year. Dividends of 4% on Preference stock, 5% on Maximum Dividend stock, and 6% on Sliding Scale stock, for the half year to Dec. 31 absorb £43,341, leaving £130,856 to be carried forward, against £111,863 brought in. Gas sales for the year totalled 20,859,935 therms, against 20,624,040 therms for 1947.

Blyth Gas Company

Revenue for 1948 amounted to £100,462 and expenditure totalled £88,219, leaving a profit of £12,243 on the year's working, compared with £9,907 for the previous year. Dividend is maintained at 7%, leaving a balance of £17,227 to be carried forward to the next account. The Directors report that the manufacturing and distribution plant has been maintained in a thoroughly efficient condition, and the make of gas during 1948 established a record in the history of the Company, a total of 1,569,167 therms having been produced.

Liverpool Gas Company

Gas sales in 1948, following record figures in 1947, showed a further increase of 2.78%. The industrial and commercial load showed an increase of 14.6% and new loads were obtained for processes previously unknown in the area. For some time a scheme has been in operation whereby 40 gas undertakings in North Wales and Lancashire have co-operated in research and other industrial development work, with Liverpool acting as the focal point. This enterprise has been extended to cover both industrial and domestic types of development and research in connexion with the application of gas. Profit for the year was £405,281, compared with £566,931 for the previous year. A final dividend of 2¾%, making 5½% for the year, leaves a balance of £136,881 to be carried forward, against £115,982 brought in.

Mirfield Gas Company

Final dividend is 2½%, making 5% for the year ended Dec. 31, the same as for the previous year, leaving £10,711 to be carried forward.

Metropolitan Gas Company, Melbourne

William Coward & Co., Ltd., report that they are in receipt of a cable from Melbourne advising that no interim dividend is being paid for the current year.

Brighton, Hove, and Worthing Gas Company

On the 6% Standard Consolidated stock, final dividend £3 3s., making a total distribution for the year of £6 6s., and on the 5% Standard Consolidated stock a final dividend of £2 13s. 6d., making for the year £5 7s.

Preston Gas Company

Profit on revenue account for 1948 was £60,678, against £57,277 for the previous year. Standard dividends on Preference stock, 5% on "A" stock and 3½% on "B" stock for the half-year ended Dec. 31, will be recommended by the Directors at the annual meeting on Feb. 25.

Watford & St. Albans Gas Company

The balance of revenue account for 1948, after charging depreciation and obsolescence, is £122,600. The net revenue account shows that after providing for special depreciation covered by taxation allowances, interest on loan capital, interim dividends, and final dividends there is a balance to carry forward of £82,675. This account has received the benefit of some £12,100, being war damage reserve no longer required, and a further £6,800 income tax reserve not now required. The accounts show that during the year £500,000 was raised by way of loan for the repayment of bank overdraft and towards the cost of additional manufacturing and distribution plant. A final Ordinary dividend of 2½% makes 5% for the year.

City of Durham Gas Company

The revenue account for the year ended Dec. 31 shows a loss of £535, compared with a profit of £6,518 for the previous year. Final dividends of 5% on the Original capital (making 10% for the year), 3½% on the Ordinary capital (making 7%) and 2% on the Preference capital (making 4%), less tax, leave £1,994 to be carried forward, against £6,427 brought in. In March, 1948, the coke ovens from which the Company obtained the whole of its supplies were seriously damaged as a result of an unofficial strike of coke workers. In consequence, no gas has been received from this source since that date. It has been necessary to recommence the manufacture of gas at the works and also to supplement this supply by the purchase of gas from the Newcastle undertaking. Greatly increased costs have been incurred as a result, partly offset by an increase of 1d. per therm in the selling price of gas as from the September meter readings, with a consequential effect on the trading results for the year. The substantial reserves built up in previous years have made it possible to meet the situation without any serious weakening of the financial stability of the undertaking. It is anticipated that supplies of coke oven gas will be available again in the spring. Sales of gas for the year amounted to 230,531,000 cu.ft., equivalent to 1,152,655 therms, representing an increase of 2.7% over 1947 and 67.2% on the corresponding figure for 1938.

Altrincham Gas Company

Profit shown by the revenue account for 1948 was £16,205, compared with £5,925 for the previous year. Sales of 715,962,300 cu.ft. of gas yielded £200,361, against £173,730, and residuals brought in £64,650, against £60,056. Statutory dividends of £4 12s. 6d.% on Original shares and 3½% on New shares leave a balance of £269 to be carried forward, compared with £4,556 brought in.

Hartlepool Gas & Water Company

The profit for 1948, after paying debenture interest and providing for taxation, &c., was £20,246, compared with £23,326 for the previous year. Sales of 5,328,252 therms of gas (against 4,881,817 therms in 1947) yielded £168,243, against £158,330, and residuals brought in £10,119, compared with £5,301. Manufacturing costs were £110,330, distribution £26,114, and management £12,591. The transfer to profit and loss account was £21,320, against £40,908. A final dividend of 3%, making 5% for the year, leaves £25,875 to be carried forward, against £25,759 brought in.

Southampton Gaslight and Coke Company

Gas sales during the year ended Dec. 31 amounted to 14,677,359 therms, showing an increase of 3.55% over the figures for the previous year. Satisfactory increases were shown in the revenue from the sale of residual products. Owing to increases in the cost of coal, the withdrawal of the subsidy on gas oil, and further advances in wages and salaries the price of gas was increased by 2d. per therm from the September meter readings. The balance carried to profit and loss account was £34,492, against £66,250 for the previous year. Final dividends at standard rates on Preference stock and at 2½% on Basic Ordinary stock, making 5% for the year, leave £54,759 to be carried forward, against £73,996 brought in.

Stamford and St. Martins Gas Light and Coke Company

When on May 1 the Company ceases to exist, the Board will be able to say with complete confidence that the undertaking was being handed over to the Government in a healthy and prosperous condition, said Mr. H. E. Dalton, Chairman, at the annual meeting of the Stamford and St. Martins Gas Light and Coke Company. Mr. Dalton said that the Board had pursued a progressive policy, installed the most modern plant, and had done their utmost to keep up with the ever-increasing demands for gas. The price of gas had been maintained at a level favourable with those of any undertaking, and until the beginning of 1948 had not been increased since 1934, in spite of continually rising costs. During the year the demand for gas created a new record and would have been even greater had it not been necessary to reduce pressures during the winter period. An agreement had been reached to supply the Market Deeping Company with gas in bulk, and the supply would be through in the near future. Mr. Dalton paid tribute to the efforts of the Managing Director (Mr. Bernard Clarke, J.P.) and the staff and said that while there was a balance available for disposal of £8,262, it was only possible to pay a final dividend of £6 7s. 6d.%, according to the operation of the sliding scale, with the increase in the price of gas of ½d. per therm on Jan. 1, 1948. The interim dividend of 7% (actual), less tax paid Sept. 1, 1948, was confirmed and the payment of a final dividend of £6 7s. 6d.% was agreed to.

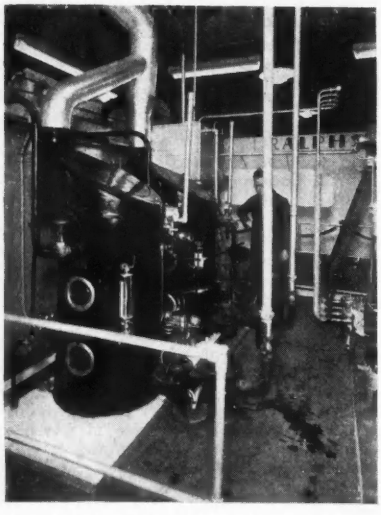
Invalid Cookery

Miss P. J. Maltby (Home Service Organizer of the Gas Light and Coke Company, Northern Division) is teaching nurses of the Archway Group of Hospitals the art of invalid cookery. The pupils are displaced persons from Europe and Java, and there are in addition an Indian from East Africa and a West African negress. The pupils are keen and some of them are cooking by gas for the first time.

Miss Maltby showing how invalid cookery is accomplished with the aid of gas.

Leather Drying

Two 8S. Controlled Flame gas-fired steam boilers used in conjunction with a leather drying conveyor machine constructed by Lister Bros., of Woolwich, and



shown at the Shoe and Leather Exhibition, Olympia. Each boiler burns 820 cu.ft. of gas an hour full on, and the combined load is 600 lb. evaporation at 80 lb. pressure.

Heavy Duty Drills

A new conception of the description "heavy duty" as applied to portable electric tools is claimed by S. Wolf & Co., Ltd., in introducing a new range of ½ in., ⅜ in., and ¼ in. drills. This claim is supported by figures of scientific and on-site tests, made under rigorous conditions and which reveal the attainment of a new high standard in portable electric drill performance and power. As an example, the ½ in. model (WD4c), drilling at full load to maximum capacity in steel, averaged just over 2 in. per minute penetration, a figure, the firm claim, well in advance of any previously achieved with this type of tool. The secret of this success lies in the technical development of the power-weight ratio and maintenance of efficient drilling speed and torque.

To achieve these results, meticulous attention has been given to every factor concerned with design and production. As a first step, the materials selected for this new range had to be of the highest obtainable quality—aluminium alloy of the greatest possible strength for the motor frames and gear boxes, nickel chrome molybdenum steel for the gears, double silk covered enamelled copper wire for the motor windings, plus varnish impregnation to give the highest possible dialectric strength.

For converting the drilling units into powerful and efficient drill presses, a robust bench stand (type ES23) with lever feed is available. The demand for machines to take taper shank twist drills has been catered for in the types WD5 and WD6, which are provided with drill spindles bored No. 2 M.T.

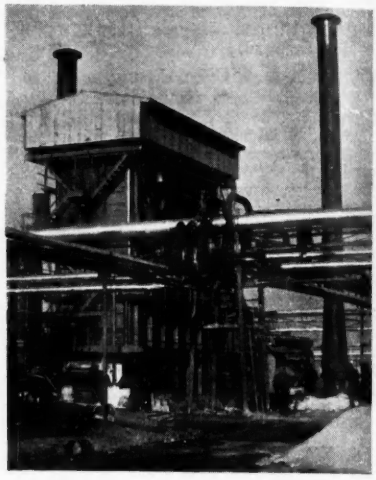
Fully illustrated and detailed lists are available from S. Wolf & Co., Ltd., Pioneer Works, Hanger Lane, Ealing, London, W.5. Telephone: Perivale 5631.

The New Conveyor Co., Ltd., of Smethwick, Birmingham, completed its Diamond Jubilee Year in 1948, and a new high record of output (including exports) was achieved. The company has increased its issued capital by £75,000 by the issue of preference shares. Mr. Norman G. Lancaster, a partner in the firm of Howard Smith, Thompson & Co., Chartered Accountants, has, with the unanimous support of the Directors, been appointed to the Board. Mr. W. Ralph Purnell, who for some years had been Managing Director, was elected to the Chairmanship when it became vacant last year. He felt that the two offices should be separately held and, as a result, personally issued an invitation to Mr. Lancaster, having joined the Board, to become Chairman. Mr. Purnell continues to serve as Managing Director.

The Pulsometer Engineering Co., Ltd., of Reading, manufacturing specialists in vacuum pumps, has issued a catalogue of their single and two stage Pacific Pumps for oil refineries and oil field services.

Catarole Cracking Process

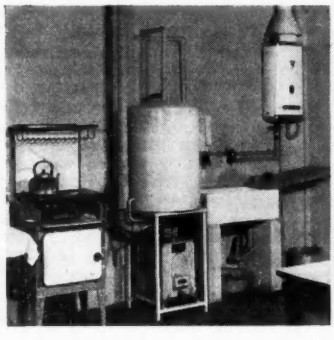
Petrochemicals, Ltd., announce that the first cracking furnace of their plant at Partington, near Manchester, employing the Catarole process, has been taken on stream and is working satisfactorily. From the beginning of operation the quality of the products, both liquids and gases, has been up to specification and the yield of the olefinic gases which constitute the valuable part of the gaseous product is higher than expected. The throughput is in excess of the rated capacity. Delivery of gases to the Manchester Gas Department has commenced.

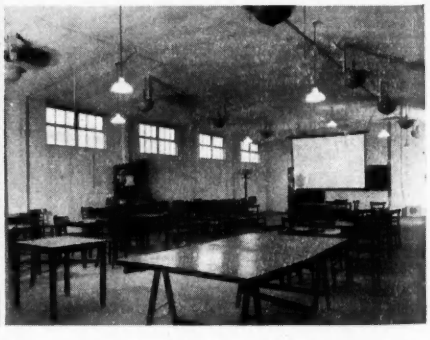


The Catarole Cracking Furnace.

The Catarole process converts an essentially non-aromatic charging stock derived from petroleum into the full range of aromatic hydrocarbons, formerly obtainable only from coal tar, and into gases rich in olefins. The process is the first of its kind to be developed anywhere and is entirely a British invention. It has been developed from the pilot plant stage by Petrocarbon, Ltd., who have also been solely responsible for the design, construction, and erection of the large-scale plant. All royalties for the patents, &c., employed are payable in the United Kingdom. No foreign currency has been required for materials, "know-how," or design.

An Indian Seamen's Mission





Instructions were received recently by the Gas Light and Coke Company to provide tropical heat at the Flying Angel Seamen's Mission, Connaught Road, Custom House, a mission for the use of Indian seamen. The picture on the left shows the kitchen in the warden's quarters, fitted with an Ascot multipoint water heater, a G.L.E.O. gas cooker, and a Potterton storage water heater for use in connexion with shower baths. The picture on the right shows overhead heaters and Vek background heaters which, when full on, raise the temperature to something approaching that of the market square in Jubbulpore.

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PUBLICATIONS

No. 21 in the series *Rope Talks*, the informative and attractive publication of British Ropes, Ltd., Carr Hill, Doncaster, sets an even higher standard of production than its predecessors. The articles, which cover a wide field, are concerned with the rebuilding of the House of Commons, the voyage of the sailing ship "Pamir" from New Zealand to London, ship salvage work, artesian wells, spiders, plate glass, and plastics.

* * *

A Short Survey of Industrial Management, by L. Urwick, is the first of a series of occasional papers published by the British Institute of Management (2s. 6d.). It contains sections on the nature of management, its evolution, mechanics and dynamics, and there is a concluding section which looks forward into the future. There is, says the author, a vast amount of work still to be done in this field and he hopes that more attention will be paid to management principles in Britain in future.

* * *

The British Institute of Management has commenced publication of a *Bulletin* intended to provide a link between the Council and staff and members and subscribers. It gives news of B.I.M. activities and details of forthcoming events. No. 4 of the B.I.M. Management Abstracts has now been published and contains summaries of many important contributions in British and foreign publications on the theme of management, including Mr. Alexander McDonald's paper, "Integration Through Grouping," published in the "GAS JOURNAL" of Nov. 10, 1948.

* * *

Rose, Downs, and Thompson, Ltd., 28, Victoria Street, S.W.1, have published a leaflet, No. 40, which describes a continuous rotary evaporator now in successful use for the solvent extraction of edible oils. The manufacturers believe that it has possible applications in other industries where there is a need for the separation of a volatile from a non-volatile liquid. The rotary evaporator is of particular value where the solution may contain finely divided solids, when a short time contact is needed, or where apparatus of extremely small overall size is required. Details of capacity and power consumption are given.

* * *

A comprehensive 127 page book on *Hardfacing by Welding*, by M. Riddihough, M.Met., A.R.I.C., F.I.M., has been published by the Louis Cassier Co., Ltd., Dorset House, Stamford Street, S.E.1 (price 8s. 6d.). It is the first publication devoted solely to this subject, and has been designed to enable the welding and maintenance engineer to hardface every type of metal. It is a practical manual covering every stage of the process, from the design of the component, choice of hardfacing alloy and technique of depositing, to inspecting and finishing methods. The book is illustrated by 81 photographs and diagrams, with 24 tables for reference and an appendix containing details of both English and American hardfacing materials.

Humphreys & Glasgow, Ltd.

The business of Humphreys & Glasgow, Ltd., founded in 1892, has recently been transferred to a new Company of the same name having the same objectives with revised Articles but with a four-fold increase in issued share capital to £400,000. The shareholders, Directors, and principal Officials remain unchanged.

GAS STOCKS & SHARES

After a week in which a fall in American commodity and stock market prices had cast a shadow over business, the large increase in the supplementary estimates contributed to a general decline at the beginning of the week. Scattered selling, which had been depressing the stock markets, eased off towards the end of the week and markets took a small but definite turn for the better. The tone was helped by signs of resistance by many companies to the rigid pegging of dividends. For the week ended Thursday evening the total number of markings on the London Stock Exchange was 33,334, compared with 34,763 for the previous week. Gilt edged securities were slightly lower at an average of 113.89, against 114.00 a week earlier.

Price changes in the industrial market were small and rather mixed, the average falling from 121.4 to 119.8. Noteworthy in the colliery group on Thursday was a jump in certain companies, particularly those with coke oven interests, as a result of suggestions that valuations of some of these interests on behalf of the National Coal Board were nearing completion.

The number of bargains in gas stocks remained almost unchanged at 261, against 266 for the previous week, and 263 a fortnight ago. East Hull and York both showed a slight increase on the week, but most of the other variations were due to ex-dividend quotations. The week's changes were as follows :

OFFICIAL LIST

Bombay, Ltd., stock (xd Feb. 16)	34/	— 39/	— 1s.
Derby, cons. ord. (xd Feb. 16) ...	134	—139	— 1
East Hull, ord.	96	—101	+ 3
East Surrey, 6 p.c. cum. pref. (xd Feb. 16)	112	—121	— 1
East Wight, cons. ord. (xd Feb. 16)	107	—112	— 1
Gas Light & Coke, ord.	22/9	— 23/9	— 3d.
Great Yarmouth, 8½ p.c. max. (xd Feb. 16)	13½	— 14½	— ¼
Hartlepool Gas & Water, 5 p.c. ord. (xd Feb. 16)	93	— 98	— 1
Mid. Southern Utility, "A" cons.	101	—106	— 1
Northampton, cons. (xd Feb. 16)	103	—108	— 1
Portsmouth and Gosport, cons. (xd Feb. 16)	146	—151	— 1
Do. 5 p.c. max. (xd Feb. 16)	101	—106	— 1
South Metropolitan, ord. (xd Feb. 16)	102	—107	— 2
York, cons. ord.	98	—103	+ 1

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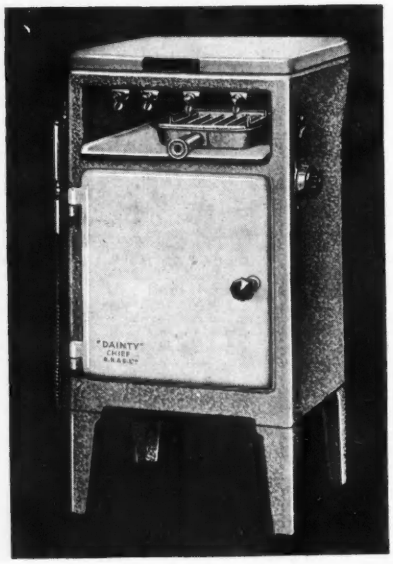

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